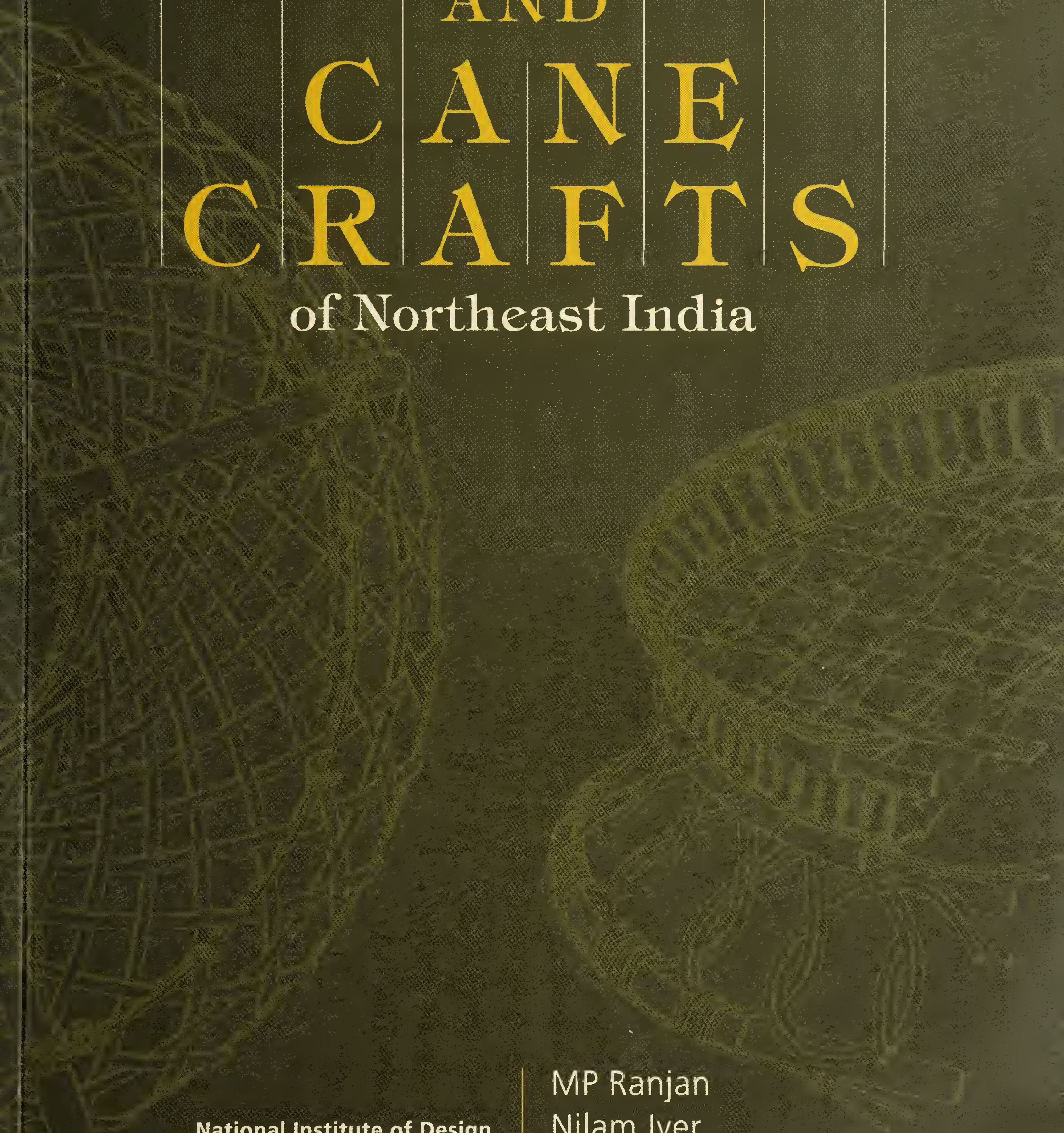
TRADITIONAL WISDOM

BAMBOO AND CANE CRAFTS

of Northeast India



National Institute of Design

MP Ranjan
Nilam Iyer
Ghanshyam Pandya

This book presents first-hand field research by a team of designers at the National Institute of Design, Ahmedabad, from 1979 to 1986. In carrying out this path-breaking project the team has set new standards of quality in craft documentations in India and elsewhere. A rich material culture based on traditional bamboo utilization has been observed with deep empathy and recorded in a meticulous manner using expressive sketches, structural diagrams, photographs and field notes, all of which form the core of the book's contents. It is richly illustrated with photographs and 400 line diagrams that reveal the intricate structure and the subtle behavior of the materials, bamboo and cane, as applied to the construction of numerous product categories. All products are an outcome of a complex interplay of culture and technology, as understood by the people of the Northeastern region of India.

The multi-level analysis has revealed numerous exciting and unique properties of bamboo and cane that hold promise for the opening up of many innovative applications for the future use of this material. The detailed technical index and subject index help draw out these qualities as a knowledge base to support future innovation. It covers the use of bamboo and cane in local housing and in building bridges, agricultural tools and containers for food storage and processing, fish traps and livelihood accessories used by the diverse peoples of the Northeastern region. Over 400 baskets collected are in the permanent archives of the National Crafts Museum in New Delhi. This is a source book for architects and designers wishing to work in bamboo and cane, reprinted in 2004, in a soft bound and easy to carry format to cope with the growing demand for knowledge about bamboo for sustainable economic development in India and the world.

Subsequent work done by the Institute's faculty and students also helps demonstrate the key role that design can play in the complex development process of this major sector of our economy.

– Dr. Darlie O Koshy
Executive Director,
NID, Ahmedabad

BAMBOO
AND
CANE
CRAFTS

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BAMBOO AND CANE CRAFTS

of Northeast India

M.P. Ranjan
Nilam Iyer
Ghanshyam Pandya

National Institute of Design

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Dedicated to

Ravi J. Matthai

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Foreword

Bamboo and cane are remarkable natural materials. They are a renewable resource which India has in abundance. Special features such as pliability and linear strength have been used to advantage by craftsmen and local engineers in many creative ways. The skills developed over the centuries have been passed on, like other crafts, without the assistance of formal instruction. These skills, and the experimentation behind them, are not very well documented and not easily learnt by those who do not have the privilege of being apprenticed to accomplished craftsmen.

It may seem that all the possibilities of using these materials must have been exhausted because of the long and close inter-action of people's lives with the environment where bamboo and cane are found in magnificent abundance. However, it is almost certain that this is not so. The needs of things and products change with time; equally, the techniques of handling the material, sometimes in combination with other materials which were not available to the original craftsman, provide new vistas for design creativity. As the authors of this excellent book point out, in spite of the large resource which India has, its share in the world's trade of products made of bamboo and cane is rather small. Clearly, there is a great deal of room for new initiatives and enterprise, and towards that end this study of what exists is an extremely useful contribution.

Given the special properties of bamboo and cane and the beauty and purposes for which these materials are already being used, as evidenced by this book, one feels sad, sometimes, that this remarkable resource should often end up as a prosaic product like paper. Perhaps there are varieties which can be best used for this purpose. On the other hand, it should also be possible now to choose and specially propagate varieties, by using new methods of propagation, which will enhance the room for structural and craft innovations. A lot of structures in the northeast and other parts of the country do depend on bamboo and indeed it is almost sacrilegious to use concrete and steel for habitations in places where bamboo is, or could be, available in abundance. Modern designers and architects have not yet expended any real effort in that direction. Perhaps this delightful book will encourage some of them to go further.

I would like to compliment Mr. M. P. Ranjan and his colleagues from the National Institute of Design for having engaged in this research project and for preparing this book. The book would be of interest to designers, craftsmen, architects, social and economic planners and, yes, even to scientists, besides a large number of people interested in the crafts and culture of this land.

Yash Pal

Preface

At the National Institute of Design (NID) several faculty members have been deeply interested in the craft traditions of our country. This interest grew out of our search for meaningful tasks for designers and design students in a developing country such as ours. The initial efforts were particularly visible in our textile design discipline where a number of pioneering projects were conducted in the handloom sector. These revealed the benefits that the intervention of trained designers working with marketing agencies could bring to craft communities. Subsequently several projects were handled in the handicrafts sector with materials such as leather, bellmetal and turned wood. These explorations brought home the fact that India's traditional skills and design repertory could well be the source of livelihood and development for millions of rural craftsmen. It was further apparent that besides appreciating the aesthetic qualities of a particular craft, designers would need to develop a strong understanding of the technical possibilities and limitations of the materials, tools and techniques used. This understanding was an essential prerequisite for any designer's interaction with crafts communities towards product innovation and diversification. In a capital-starved economy the designer had to work within the framework of existing technologies, locally available materials and skills. The produce of the crafts communities on the other hand had to compete on equal terms with new industrial products. The social milieu in which the craft is practised and the entrepreneurial capabilities of craftsmen were further complexities. Our work with Gurjari, the marketing wing of the Gujarat State Handloom and Handicrafts Corporation, and intervention at Jawaja block of Rajasthan as part of "The Rural University" experiment are some outstanding examples of design intervention.

The above mentioned observations formed the backdrop of this study of the bamboo and cane crafts of the northeastern region of India. In 1979 the All India Handicrafts Board, now called the office of the Development Commissioner of Handicrafts, Government of India, asked NID to study the crafts of this region. This was immediately seen as an exciting and challenging opportunity as one of our colleagues had just then completed a preliminary study of the textile and bamboo crafts of the seven northeastern states on behalf of the Northeastern Council. This survey revealed an immense resource of materials, skills and techniques existing as a living tradition. Bamboo being a new material for us our first efforts were to develop an understanding of its properties and limitations. We felt that the best way would be to learn directly from the craftsmen by observations and interactions. We commenced field work in November 1979 which extended till June 1980 with a break of one and a half months in the beginning of 1980. This extensive travel and interaction with local craftsmen led us to the staggering realisation of the immense variety of products, indigenous techniques and constructions that the local mind has evolved over the ages and refined to a fine art. This knowledge had so far remained in the oral tradition of the land being passed on from generation to generation. Our objective while documenting this resource was to try and set out all this information in an organized and retrievable manner. Armed with this basic information, designers can take the next step in the design process.

Our own skills of observation and recording in the field improved as we progressed with our study. We had set out with a basic checklist of the type of information needed and with the designer's typical tools such as cameras, sketch books, pencils, pens, note books and measuring tapes. Our field note books filled out with freehand diagrams and notes became a record of our journey and observations. Wherever possible product samples were acquired and periodically transported to Calcutta. Over 350 different products were collected, each being carefully catalogued. After completion of the field work these products were analysed with the aid of an elaborate interaction matrix of products versus attributes and qualities. This phase of analysis and classification was carried out between July 1980 and July 1981. Simultaneously the preparation of all artworks of illustrations, studio photography of products and literature search were carried out at the NID campus. Each drawing prepared for the book illustrates an interesting principle of construction or a specific property of material as exemplified by the particular product. As far as possible the formal proportions of the product or individual elements that make up the product or part have been faithfully retained. We got an opportunity to supplement our field work in Manipur when the state government of Manipur commissioned us to design their pavilion at the 1981 India International Trade Fair at New Delhi. The final documentation was submitted to the sponsor in May 1982.

We would like to point out that this study is by no means a comprehensive record of the bamboo and cane products, techniques and craftsmanship resources of the northeastern region. It is but the proverbial tip of the iceberg. It was not our intention to prepare a comprehensive documentation. Our object was to develop a sufficiently strong understanding of the materials, techniques and the socio-economic milieu in which the craft is practised so that informed design assistance to crafts communities could commence. We have already commenced product development projects for the state government of Tripura and we hope other designers can join us in using the information presented in this book for the benefit of the craftsmen of the region.

There are many ways to structure the material presented in this book. However, we chose to group the products by their function and structure rather than on a tribal or regional basis. This arrangement, in our opinion, reveals a meta-language that assists in developing an understanding of properties of materials and structures as appreciated by the local mind. Technical information, on various aspects of the materials studied, has been separately included in the appendices. In order to enable readers, from a variety of disciplines, to obtain easy access to the information we have included a technical index and a subject index. These contain a fairly high degree of cross-referencing in our attempt to make the book as "user-friendly" as possible.

Besides other designers, the audience that we had in mind include craft trainers and trainees both within the northeastern region and outside. We hope that this book will be used both as a text-book and reference resource at our craft training centres. We would also like to see it being used by administrators and craft promotional and development agencies involved in the development of crafts and the economic development of the region. We hope that the people of the northeastern region will take pride in their achievements and sustain this living tradition for their own benefit and for the country as a whole.

M. P. Ranjan

Acknowledgements

In a work of this nature it is impossible to mention all the individuals who have assisted the project in various ways. The authors are indebted to all the craftsmen of the northeastern region who have either through their work or through interviews and discussions provided product examples and information which are the most important contributions to this book.

We would like to thank all the State and Central Government Officials who have assisted us as guides and advisors during field work in the northeastern region; particularly Shri S. K. Jana of the All India Handicrafts Board's (AIHB) cell at Gauhati; Shri S. Krishnan, Director of Industries, Arunachal Pradesh; Shri E. L. Reade, General Manager, Meghalaya Handicrafts Development Corporation, Shillong; Shri M. P. Bezbarua, General Manager, North Eastern Handloom and Handicraft Development Corporation (NEHHDC), Shillong; Shri B. K. Baruah, Regional Manager, NEHHDC, Gauhati; Shri Holkamang Haokip, Minister of Industries, Manipur; Shri Jel Shyam, Commissioner of Industries, Manipur; Shri P. L. Thanga, Director of Industries, Manipur; Shri S. Mathur, Director of Industries, Mizoram; Shri Akang Ao, Deputy Director of Industries, Nagaland; Shri Kalyan Dey, Deputy Director, AIHB; for all their help, support and guidance during our field trips.

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Shri S. Narendra Prasad of the Indian Institute of Science, Bangalore, reviewed the botanical data included in the appendices. Prof. Eda Schaur of the Institute of Light-weight Structure, Stuttgart, assisted us in locating published information on bamboo structures.

In addition to individuals, the institutions that were a source of information were the Forest Research Institute, Dehradun, the Botanical Survey of India, Shillong, and the Anthropological Survey of India, Calcutta.

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Credits

Drawing of structures and construction details were conceived and executed by the authors with the assistance of Shri Bharat Vatalia and Shri Sanjiv Shah. Maps of the region were designed and executed by Shri Dilip Oza. All field photographs were recorded by the authors. Studio photographs of products were recorded in the Institute's Photography Department by Shri F. N. Pathan and Shri Ajay Gehlot under the direction of the authors.

Photographs of bamboo plants were recorded in the field by Kum. Brinda Datta. Photographs of bamboo and cane products at Hopoli Museum were recorded by Shri M. P. Manohar. All line drawings were copied by Shri D. B. Mistry, Shri B. D. Suthar and the staff of the Institute's Printing Department. Photographic prints for the preliminary report and for final artworks were prepared by Shri Kamal Kansara, Shri Mahendra Dave and Shri Valji Kalaji under the supervision of Shri M. F. Jadli of the Institute's Photography Department.

Several typists were involved in preparing the preliminary drafts. However, Shri Gopalan Nambiar typed the final draft and press copy of the manuscript for this book.

Smt. Carmen Kagal undertook the complicated task of editing the manuscript and spent many hours in consultation with the authors to refine the language used in the text, restructuring the appendices, evaluating the appropriateness of photographs with supporting captions and in preparing the press copy.

Shri N. Gopalakrishnan assisted the authors in compiling the bibliography. Shri Y. K. Doshi helped the authors to prepare the technical and subject index. Shri Sudarshan Dheer of Graphic Communications

Concepts, Bombay, designed this book and supervised its production. The task of proof reading was carried out by Shri N. T. Amritmahal. This book was typeset, printed and bound at the Tata Press Limited, Bombay, coordinated by Shri Joe Rego.

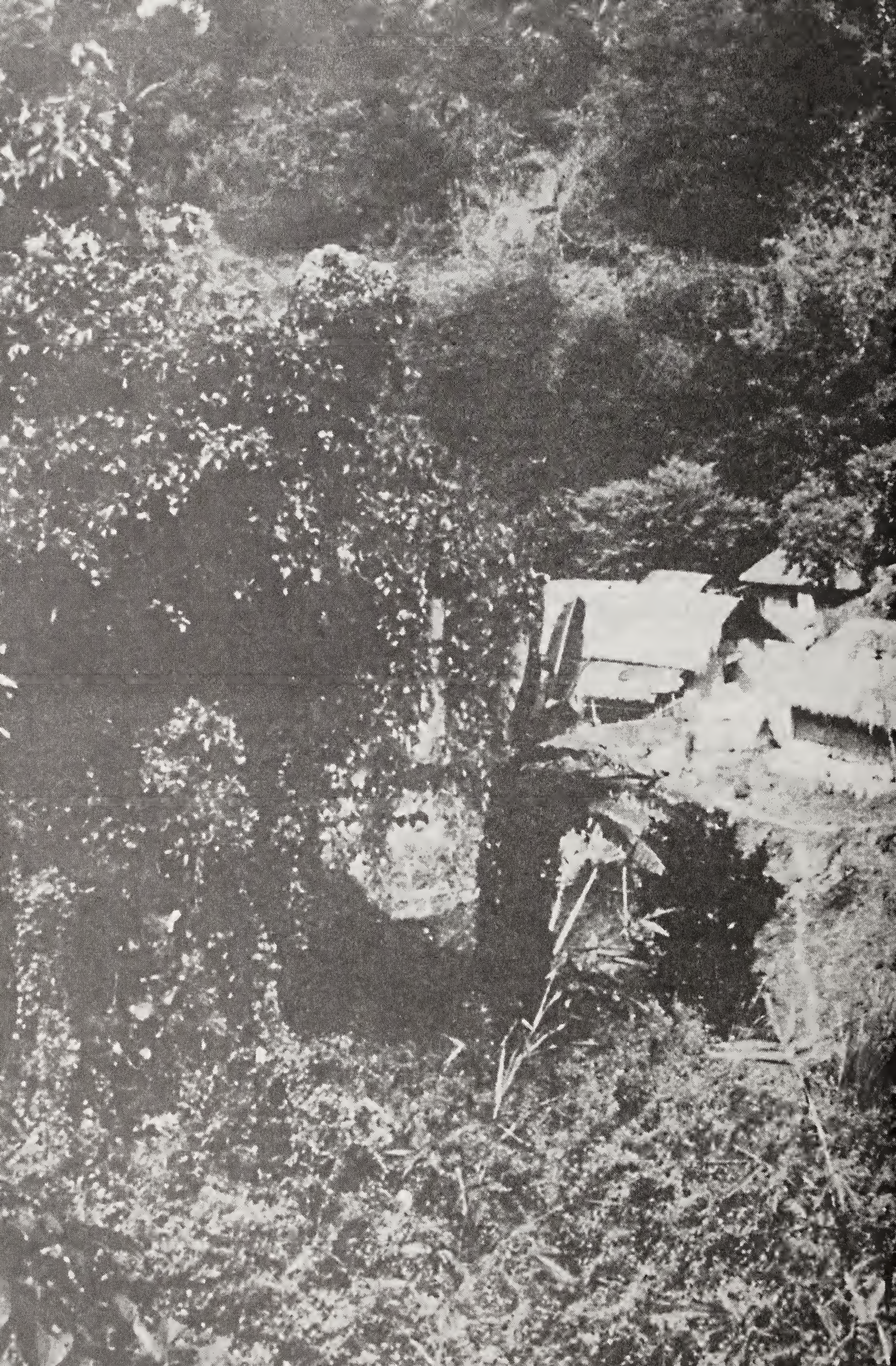
Source Credits

A number of published sources were referred to especially for the sections on The Region, The Materials and Appendices. A complete list of these publications are included in the Bibliography. The major sources of reference for the materials include F. A. McClure, K. Dunkelberg, Ashutosh Kumar and Koichiro Ueda. The Council of Scientific and Industrial Research and the Forest Research Institute's publications were used extensively for compiling botanical information included in Appendices IV and VI. Appendix I draws much of its information from F. A. McClure and Koichiro Ueda. Appendix II is based largely on Ashutosh Kumar's paper. Appendices III, V and VII are based entirely on fieldwork conducted by the authors. All other information in the book is the result of fieldwork and analysis conducted by the authors.

The following illustrations were redrawn based on sources listed below:

Luis Marden	:	Fig. No. 20
F. A. McClure	:	Fig. Nos. 24, 25, 29, 31, 32, 33, 35, 36, 37, 38, 39, 40, 41, 42, 43 and 44.
K. Dunkelberg	:	Fig. Nos. 27 and 45
Ashutosh Kumar	:	Fig. Nos. 46, 48 and 49
Aditi Shirali	:	Fig. 257 A to E
Robert Austin and Koichiro Ueda	:	Fig. No. 783

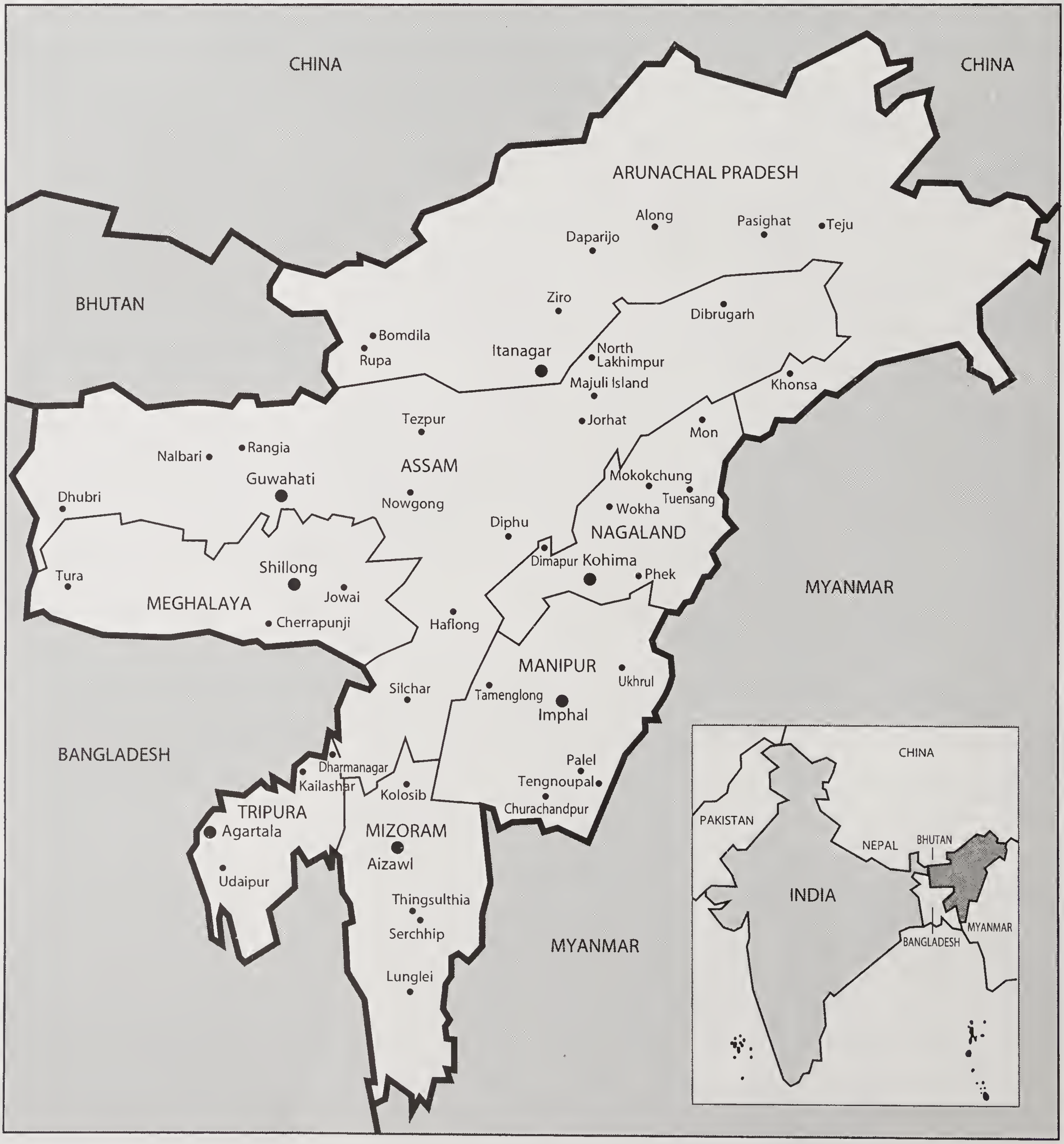
All other illustrations are the result of direct observations and analyses conducted by the authors.



THE REGION

The Environment

1: Map of Northeastern India. The key map indicates the location of the area.



Geography and Administration

In the northeastern region of India, large areas are covered by dense forests (fig. 1). Where land has been cleared for cultivation, especially in the plains, the fields form a patchwork of green and yellow stretching to the horizon. Cultivated plots are punctuated by islands of bamboo and palm which surround the dwellings in the plains (fig. 2). Hilly areas support dense tropical rain forests on lower slopes and evergreen trees such as pines at higher altitudes (fig. 3). These forests represent an immense natural resource providing a wide range of palms including canes, numerous species of grasses, reeds and bamboo as well as innumerable flowering, fruit and medicinal plants. Travelling through the region one can see hill upon hill covered with thick vegetation and in some places covered entirely with bamboo, which in the distance resembles a soft, furry cover.

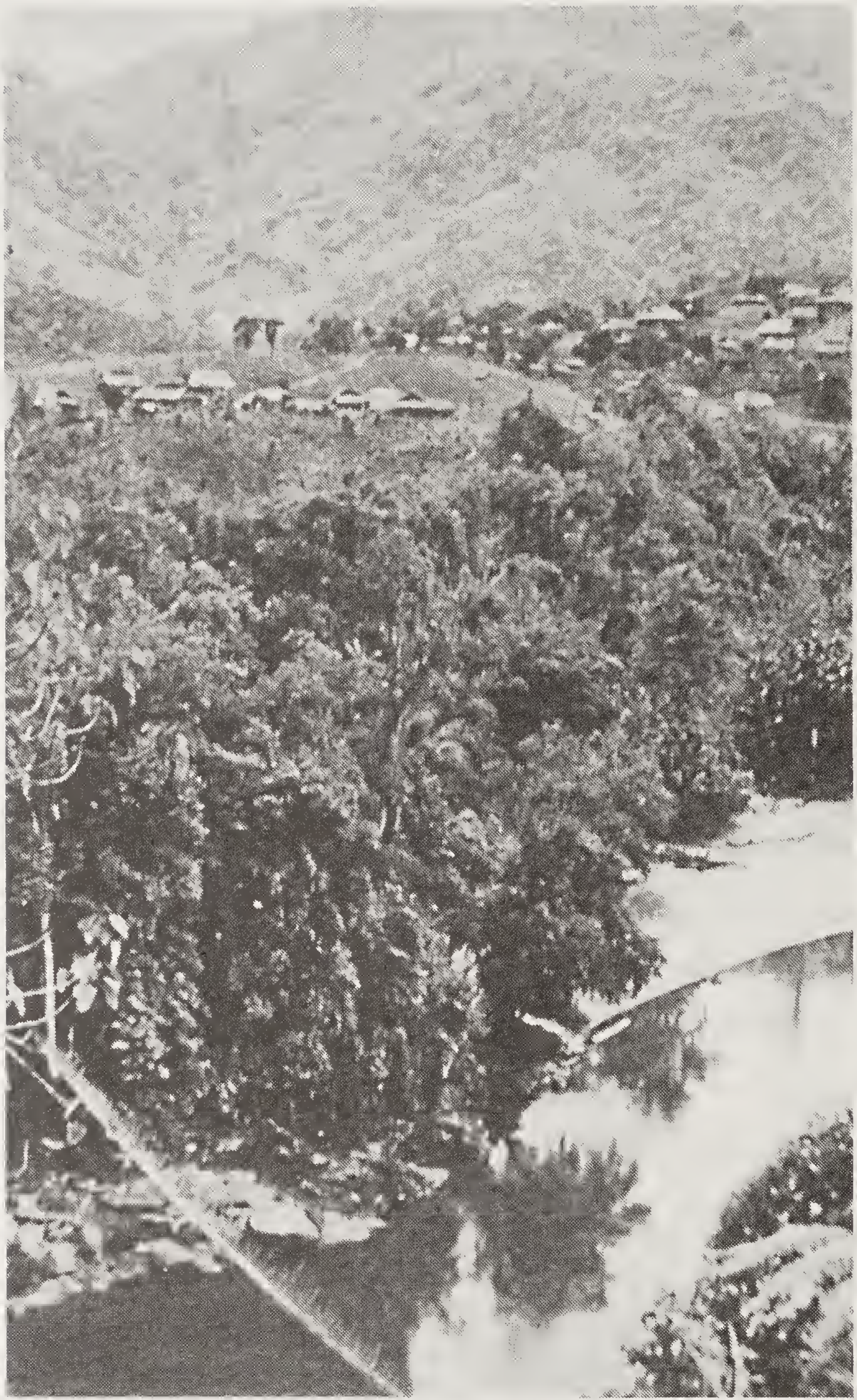
Terrain

Continuous hills interspaced by vast plains along river valleys are two distinctive features in the northeastern region. All seven states of the area have extensive hilly regions (figs. 4-8). Only three of these states have relatively large areas of plains land. These plains are located in Assam, Manipur and Tripura. The other four, Arunachal Pradesh, Meghalaya, Mizoram and Nagaland are almost entirely composed of hills. The structure of these hills is quite rugged, with steep gorges created by narrow mountain streams and a great many peaks. Maximum altitudes are reached on the northern borders of Arunachal Pradesh, where several peaks are well above the snow line. The eastern boundary is equally rugged along the borders of Nagaland and Manipur. Very few mountain passes exist in the north and east, ensuring the relative isolation of the region from the rest of Asia. These hills are relatively young geologically and are still active, resulting in frequent earthquakes and landslides as the process of consolidation continues.

The region is fairly rich in mineral resources not yet fully exploited. Oil was one of the first resources to be extracted, with oil fields in Digboi, Assam. Other major resources include coal and limestone. Here the process of identification and exploration continues.

Climate

The temperature ranges from moderately warm in the plains in summer to freezing cold in the hills in winter. During the summer months the hills are extremely pleasant, though it rains heavily. During winter, except for some places located at higher altitudes in the hills, the weather in most places, both in the plains and the hills, is extremely pleasant. The entire region receives very heavy to moderately heavy rainfall in summer. The monsoon rains normally start around April-May and can continue till September, though it may rain at other times of the year too. Cherrapunji in the Khasi Hills receives the maximum average annual rainfall in the world with an average as high as 12,500 mm. In other places it can range between 1,750 mm upto the Cherra average. This very heavy rainfall during the monsoon creates considerable disruption in communications especially in remote villages and districts not connected by all-weather roads.



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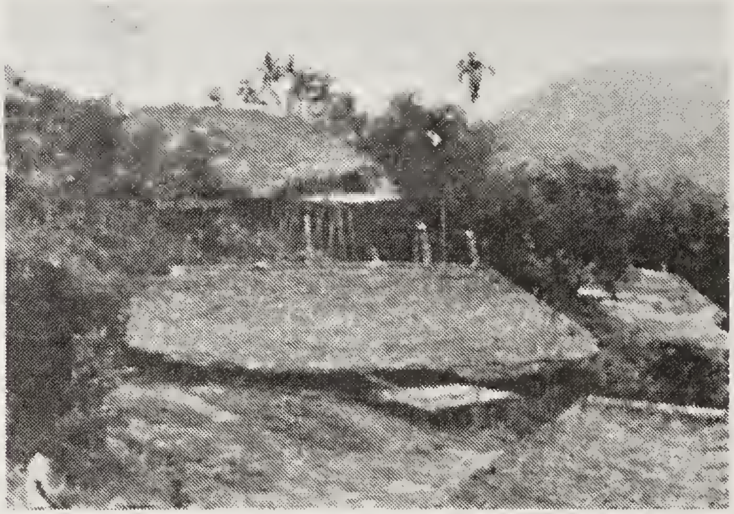

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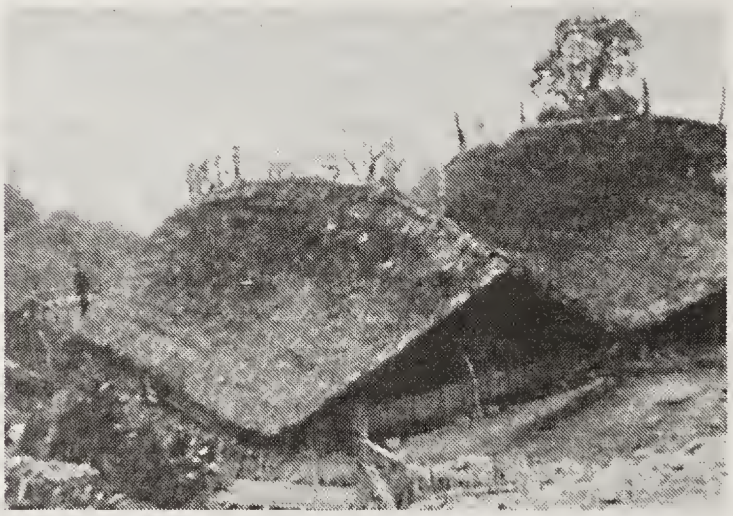

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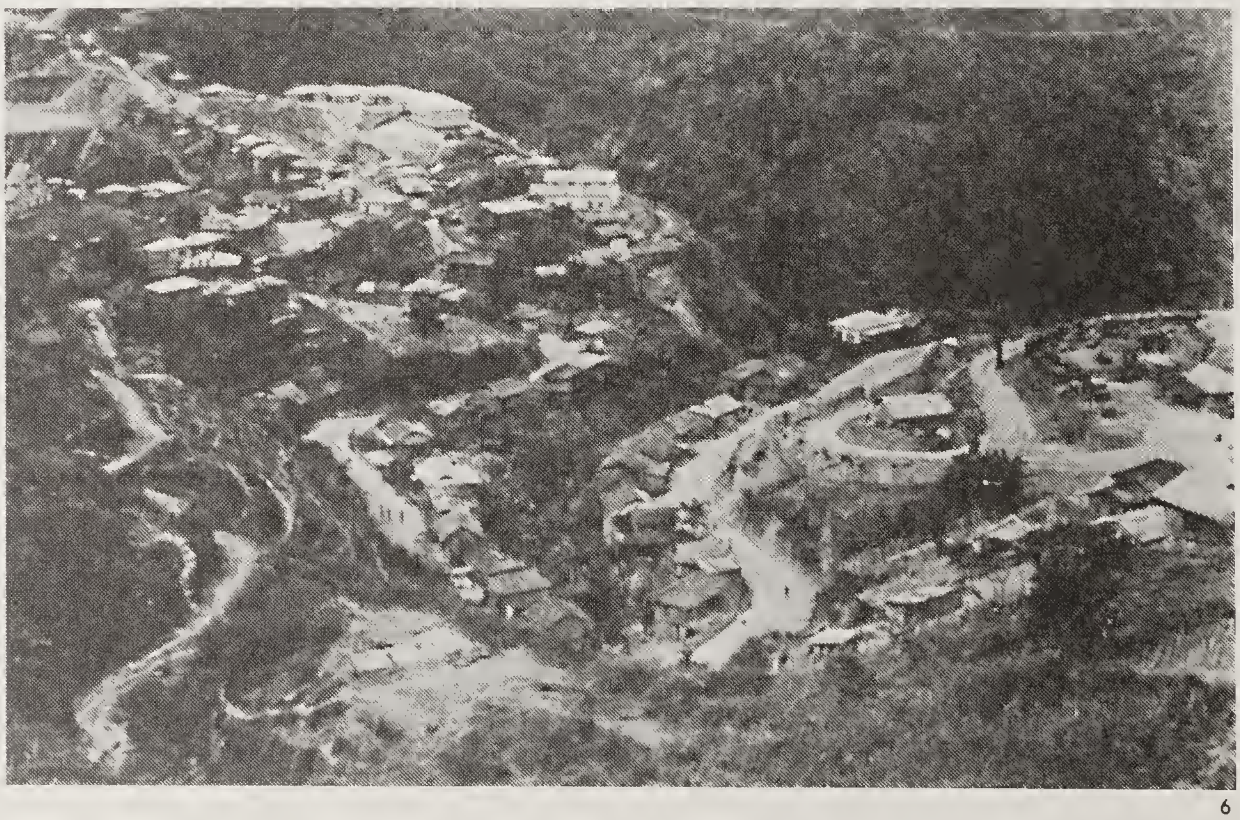

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2: A cane suspension bridge leading to an Adi Gallong village on a hill.

3: Rice fields with islands of bamboo and palm groves; a typical view in the plains of Assam.

4: A Wancho village in Arunachal Pradesh.

5: Konyak Naga houses in Mon District of Nagaland.

6: Thingsulthia, a village in Mizoram.

Administrative Division

All states and Union Territories in the northeastern region of India, besides having common boundaries with adjoining states, have extensive international boundaries with Bhutan, China, Burma and Bangladesh. The region is physically connected to the rest of India through a narrow link in western Assam lying between Bhutan and Bangladesh. Arunachal Pradesh has Bhutan to its west, China to its north and Burma to its east. Nagaland and Manipur have Burma along their entire eastern boundary. Mizoram has Burma to its east and south, and Bangladesh to its west. Tripura has Bangladesh to its east, south and west. Assam has Bangladesh along the eastern border of its Cachar District while Meghalaya has Bangladesh to its south and west.

Assam

The state of Assam is centrally located with all other states or Union Territories distributed around it. Hence all road and rail communications to these areas are through Assam. The state can be divided into three distinct natural regions. These are the plains of the Brahmaputra River valley in the north, the plains of the Barak River valley in the south with the intervening hilly region composed of the North Cachar District and Karbi Anglong (Mikhir Hills).

The valley of the Brahmaputra is an alluvial plain about 800 kilometres long and 80 kilometres broad running east to west. The mighty Brahmaputra divides the valley in two along its entire length in the plains and there is only one bridge at Gauhati linking the north and south banks of the river. The state is divided into ten administrative districts. These taken from west to east are: Goalpara, Kamrup, Darrang, North Lakhimpur and Dibrugarh on the south bank. Goalpara and Kamrup extend on both banks of the river. To the south of the valley and adjoining Naogong and Sibsagar are Karbi Anglong (Mikhir Hills), the North Cachar Hills District and Cachar District, extending from north to south in that order. The major towns/district headquarters of Assam are Goalpara, Gauhati, Tezpur, Naogong, Jorhat, North Lakhimpur, Dibrugarh, Diphu, Haflong and Silchar. Dhubri, Khokrajar, Barpeta, Mangaldoi, Jorhat and Kharimganj are six new administrative districts formed recently to improve the administrative infrastructure.

Arunachal Pradesh

The Union Territory of Arunachal Pradesh, previously known as NEFA (Northeast Frontier Agency), extends to the north and east of the Brahmaputra valley. It sits atop the eastern Himalayan range including the foothills. A number of rivers running north to south cut through this territory to join the Brahmaputra in the plains of Assam. All districts are named after the major rivers that pass through this area. The districts of Arunachal Pradesh taken from east to west are Kameng, Subansari, Siang, Lohit and Tirap. Recently Kameng and Subansari districts have been further divided into two

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7: Terraced fields of the Angami Nagas in Khonoma.

separate districts, in order to speed up the development process in these areas. The hills of Arunachal are steep and precipitous with peaks at its northern boundary with China well above the snow line. Roads linking the districts are in the north-south direction along river valleys. Hence, communication between districts is through the highway in Assam on the north bank of the Brahmaputra River. Many parts of Arunachal are inaccessible during the monsoon months. Difficulty of access and the lack of government controls have ensured that the area has retained much of its natural wealth in the form of undisturbed tropical forests and mineral resources.

The major towns/district headquarters of Arunachal are Bomdila, Rupa, Ziro, Daparijo, Along, Pasighat, Teju and Khonsa. Ittanagar is the new capital of Arunachal, named after the ruins of an ancient brick fortress at the site.

Nagaland

The state of Nagaland was formed as the home of the Naga tribes living in the eastern hills of undivided Assam. It is bounded on the west by Assam, on the north by Arunachal, on the east by Burma and on the south by Manipur. The entire state is covered by steep hills and the highest peak, Saramati, is 3,841 metres high. The main rivers are Dhansiri, Doyang, Dikhu, Melak, Tizu and Zunki.

Nagaland is divided into seven administrative districts. These are Mon, Tuensang, Mokokchang, Wokha, Zuneboto, Phek, Kohima and Dimapur. Districts are named after these towns. Dimapur is the only town located in the plains and has Nagaland's only railhead and airport. Kohima is the capital of Nagaland and is a historic landmark of World War II in the eastern sector.

Manipur

The state of Manipur is located to the east of Assam and south of Nagaland. On its eastern boundary is Burma and to its south is Mizoram. Manipur too is a hilly region except for a large bowl-like valley around the state capital, Imphal. This valley is an extremely fertile plain which is fully cultivated and densely populated. Loktak Lake which is the only natural lake in the entire northeastern region is located in the southern part of this valley.

Manipur is divided into six administrative districts. These districts taken clockwise are North District, East District, Tengnoupal District, South District, Tamenlong District and Central District. The last is in Imphal Valley with all the others around it. Central District is in two parts with its second part located in the plains near the Assam border. The district headquarters of Manipur are Imphal, Ukhrul, Senapati, Tamenlong, Churachandpur and Chandel. The other important towns are Mao, Tengnoupal, Palel, Kakching, Moirang, Bishenpur and Jiribaum.

Meghalaya

The state of Meghalaya lies wedged between the plains of Assam and Bangladesh. It consists of the Jaintia, Khasi and Garo hill ranges running east-west and named after the tribes that inhabit these hills. The southern face is a sheer drop overlooking the plains of Bangladesh. In the east these hills link up with the hill districts of Assam's North Cachar Hills. These form a continuous chain of hills at right angles to the Naga hills and Patkoi range which is in the north-south orientation. Shillong, which is the state capital, occupies the highest altitude in the entire range. It is certainly one of the most beautifully developed cities in the northeastern region and used to be the capital of undivided Assam. Its central location as well as the numerous institutions located there make it an important centre in the Northeast. Meghalaya is divided into three administrative districts. These are the Garo Hills District, the Khasi Hills District and the Jaintia Hills District. The major towns/district headquarters of the state are Jowai, Shillong, Tura and Cherrapunji. Barapani is a large artificial lake near Shillong which is being developed as a holiday resort.

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8: Hills in Mizoram covered with a dense growth of bamboo partially cleared for *jhum* cultivation.

Mizoram

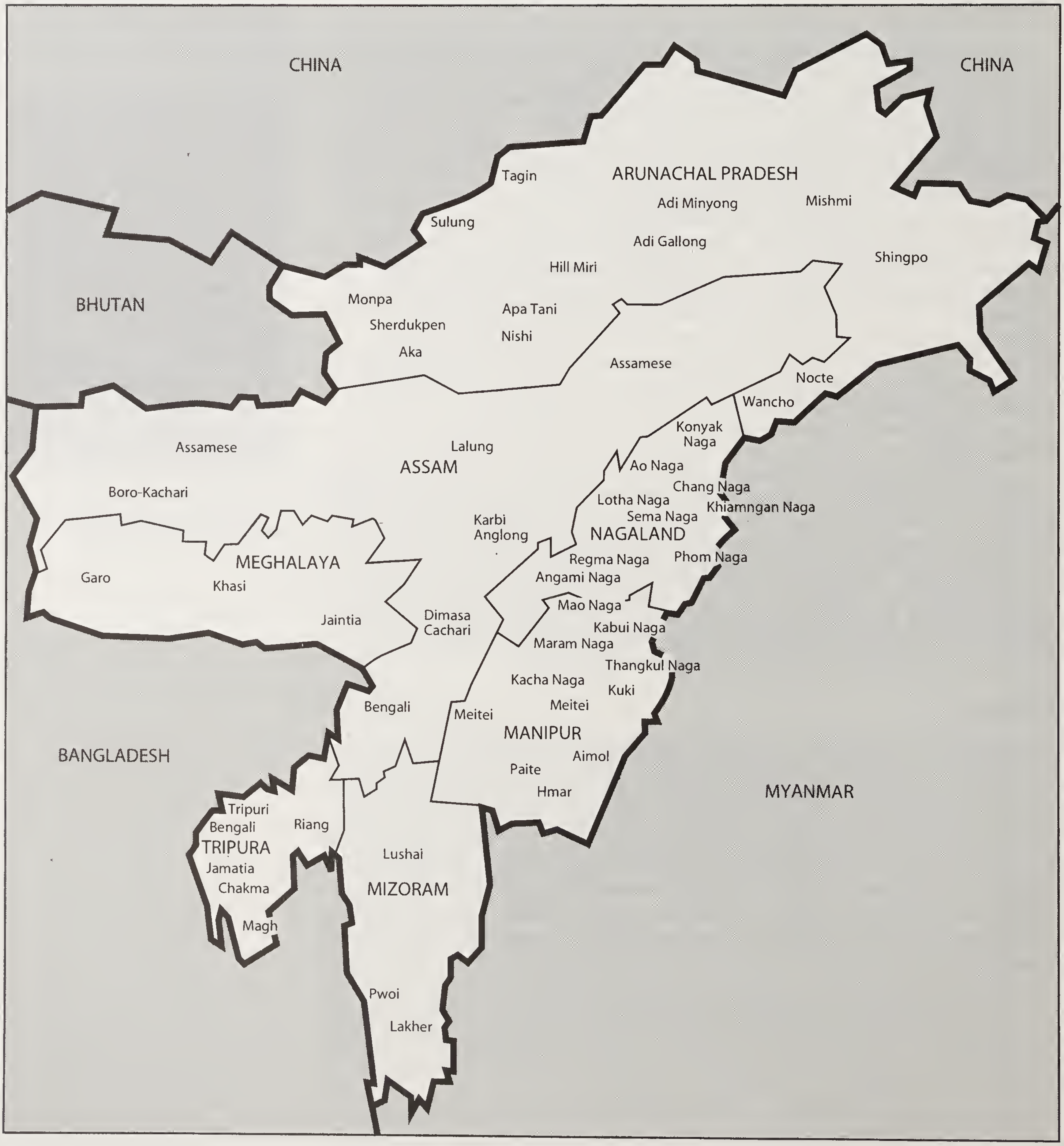
The Union Territory of Mizoram sits atop seven parallel hill ranges running in the north-south direction. These hills are part of the Arakan hill tracts that extend into Burma. In the north it is bounded by Assam's Cachar District and Manipur. To its east and south is Burma and on its western boundary are Bangladesh and Tripura. The territory derives its name from its major tribe, the Mizos, which literally means settlers of the hill top. It is divided into three administrative districts—Aizawl District, Lunglei District and Chhimtuipui District, each named after its major town.

Tripura

The state of Tripura is composed of both hills and plains. 60 per cent of the state is hilly. The plains located along its border with Bangladesh are fertile and densely populated. Tripura was a princely state before joining the Indian Union and its name is derived from its ruling tribe, the Tripuris. The state is located south of Assam and west of Mizoram. It is bounded on its west, south and east by Bangladesh, and is divided into three administrative districts—North Tripura, West Tripura and South Tripura. The major towns/district headquarters are Agartala, Belonia, Amarpur, Kailashahar and Dharmanagar. Agartala is the state capital and Dharmanagar its only railhead.

People

9: Map of Northeastern India showing location of tribes.



History and Culture

The people inhabiting the various states of the northeastern region of India are an extremely diverse group of tribes and ethnic groups (fig. 9). Each of these groups maintains its own distinctive lifestyle with its own strongly individual character (figs. 10-19). Historically there has been a great deal of isolation between tribes within the same region and with the outside world. This isolation allowed each group to develop over several centuries its distinctive culture and traditions. These aspects are very eloquently reflected in the tremendous diversity seen in the material culture of each of these groups. Each of these tribes is further divided into several sub-tribes or clans, generating a variety within a given tribe. Each speaks its own language or dialect quite different from even those of neighbouring tribes.

Most of these tribes are of Tibeto-Burmese origin, except for the Khasis of Meghalaya who originated from the Mon Khmer group of tribes. These people have over the centuries migrated from the east and settled in the region, learning to adapt to the peculiarities of climate and terrain of the chosen settlement. The historical details of their migration into India is not known. They did not arrive in a single movement but in several migratory waves. Their initial presence in Northeastern India was noted as far back as the 10th century B.C. However, these migrations continued over the centuries and most of the present tribal groups are believed to have come after the invasion of the Aryans into Western India.

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10: A Nishi bride.

The tribes of Northeastern India could be broadly classified into two main groups, namely, the settlers of the plains and the settlers of the hills. There is a strong distinction between the lifestyles of each of these groups. The settlers of the hills established themselves in small permanent settlements which were quite self-sufficient in food and materials for housing and other requisites of day-to-day living. While the settlers of the hilly regions of the eastern Himalayas, the Patkoi ranges and the Arakan hill tracts remained relatively isolated from each other there developed in the plains of Assam, Manipur and Tripura powerful kingdoms of lasting influence. In the 7th century A.D. the kingdom of Kamarupa (Assam) flourished to extend its rule over much of Assam as well as parts of Bengal. The Ahoms invaded the Brahmaputra valley from the east in the 13th century to rule uninterruptedly, till the arrival of the British. Assam gets its name from the Ahoms who ruled it for nearly 600 years. The Ahoms gradually converted to Hinduism from their own tribal religion. Similarly in Manipur, the Meiteis too converted to Hinduism under the influence of Hindu Brahmins from Bengal.

In the hills the various tribes continued to practice their own religion till the arrival of the British brought Christianity which was adopted by several Naga and Mizo tribes. The British entered the region in 1826 when Assam and Manipur were brought under British rule. Although they exerted considerable administrative influence in the plains their impact in the hills was quite restricted. Assam now experienced a new migratory movement, this time from the west and south. The movement of Bengalis and others continued in the events that followed India's independence from British rule. The state of Tripura too had its share of Bengali immigrants which changed the demographic make-up of certain areas of both states considerably. As

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11: Dimasa Cacharis at Samkhor village.

12: Angami Naga children at Kohima village.

13: A Meitei woman winnowing grain in Patsoi village.

14: Konyak Naga girls at Chen village.

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developmental efforts increased over the past 30 years hitherto inaccessible areas of all the states have been increasingly open to outside influences. In spite of this, individual tribes of the entire region still retain much of their original undisturbed culture. This is particularly true of hill tribes inhabiting remote border villages in Arunachal Pradesh, Nagaland, Manipur, Mizoram and Tripura where the Indian government restricts access of outsiders in the interest of the local inhabitants.

Arunachal Pradesh has as many as 16 major tribes, of which the Adi group is the largest in number, followed by Nishi, Wancho, Monpa, Nocte, Tagin, Apa Tani and Hill Miri tribes. The other tribes are Aka, Bongro, Khamti, Miji, Mishmi, Sherdukpen, Shingpo and Sulung tribes, all of which are relatively small in number. The Adi tribe lives in the Siang District and is divided into sub-groups such as Adi Gallong and Adi Minyong. They practice shifting cultivation or *jhum* and their houses built along hill slopes have the unique pigsty latrine. The Nishi tribe who lives in the Subansari District do not build large villages. However, their typical long houses of bamboo and wood each shelter several families. The Apa Tani tribe lives in a densely populated bowl-like valley surrounded by the Nishi and Hill Miri tribes. They are outstanding in their agricultural methods and in trade. The Apa Tanis cultivate terraced rice fields irrigated by a refined system of small dams and diversions. They cultivate bamboo and pine in permanent groves near their villages, all of which are concentrated in one single valley. The Monpa tribe lives in the Kameng District. They are Buddhist with a good deal of Tibetan influence. Their houses are made of stone and they build water-mills used for pounding rice. Although large bamboo does not grow at the high altitudes of their habitat they are excellent craftsmen in bamboo and wood. The Wancho and Nocte tribes live in the eastern district of Tirap. They are similar in many ways to the Konyak Nagas. The Wancho men wear cane belts permanently fixed around their waist. Wancho belts are dyed black, while the Konyak belts are the natural yellow of oiled cane.

Assam is composed of both tribal and non-tribal populations. The tribes of the plains include the Boro-Kachari, Mishing, Mech, Lalung and Chutiya tribes. The Dimasa Cachari tribe lives in the North Cachar Hills while the Karbi Anglong tribe lives in the Mikhir Hills, both inhabitants of the two hill districts of Assam. The non-tribal population includes Assamese and Bengalis. Cachar District in the south is predominently Bengali, while the districts of the Brahmaputra valley have large concentrations of both Assamese and Bengalis.

Meghalaya has three major tribes, namely, the Khasi, Garo and Jaintia tribes. The Khasis are a highly developed group and have a matriarchal form of society. Khasi women dominate many of the traditional institutions and are active both in craft and trade. The Hajong tribe is a relatively small tribe of the state.

Nagaland, as the name suggests, is the home of several Naga tribes. This name was given to them by the Ahoms who collectively called all the primitive tribes who settled in the eastern hills bordering Burma as the "Nagas".

15: Apa Tani children at Dutta village.

16: Mizo girls at Serchip.

17: A local bazaar in Assam.

18: Khasis at a bazaar in Central Meghalaya.

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The major Naga tribes of the state are Angami, Ao, Chang, Khiamngan, Konyak, Lotha, Phom, Rengma and Sema Naga. With the exception of the Angami Naga tribe all the others practice shifting cultivation. The Konyak Nagas live in the northern district of Mon. To their south are the Chang Naga and Khiamngan Naga tribes in Tuensang District. The Ao Naga and Lotha Naga tribes occupy Mokokchung District. Angami Nagas live in Kohima District and are noted for their elaborately-terraced agricultural fields. The Angami Nagas are also well-known for their fierce resistance to the British. The other tribes of Nagaland are the Sangtam, Yimchunger, Chakesang and Zeliang Nagas. A number of other Naga tribes live outside the state of Nagaland, in Manipur and Burma.

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19: An Adi Minyong child carrying her little brother.

Manipur's largest single ethnic group is the Meiteis who occupy the Imphal Valley and the plains around Jiribaum. Meiteis have developed literature and art, dance and music to a high degree of refinement. They gave the world the game of polo. Meiteis too have a matriarchal family structure, with the women playing an active role in everyday life. The Meiteis are popularly known as Manipuris.

The other tribes of Manipur, of which there are many, can be divided into two major groups. The first is the Naga group while the second is the Lushai-Kuki group. The Naga group includes the Thangkul Nagas who live in the North District and is the largest tribe. They are followed by the Maram Naga, Kabui Naga, Kacha Naga, Mao Naga, Aimol and Anal. The Lushai-Kuki group includes the Hmar, Paite, Chothe and Chira who inhabit the South District bordering Mizoram.

Mizoram is the home of the Mizos, which literally means dwellers of the hill top. The Lushai tribe is the single biggest group occupying much of central and northern Mizoram around Aizawl. The Mizos are all Christians and have one of the highest literacy levels in the country. The two smaller tribes of Mizoram are the Lakher tribe living in the southern region and the Pwoi tribe in the southwest.

Tripura derives its name from its ruling tribe, the Tripuris, the single biggest tribe in the state. The plains around Agartala have a very large population of Bengali settlers. The other major tribes of Tripura are the Riang, Chakma, Jamatia, Mogh and Mariang.

One feature that is common to all the tribes of the northeastern region is their exquisite use of bamboo and their dependence on things made from bamboo. Bamboo is so much a part of their lives that it is difficult to think of the northeastern region without associating it with images of bamboo products and bamboo structures. In many tribes the umbilical cord of a new born child is cut with a bamboo knife and the dead are laid to rest on bamboo beds. Bamboo shoots are eaten either roasted or pickled. Rice is eaten in bamboo plates and carried in bamboo baskets and rice beer is drunk in bamboo mugs through bamboo drinking straws. Bamboo poles with trimmings symbolise religious commitment and are used as decorations on auspicious occasions. Surely the people of the northeastern region can be said to have a bamboo culture.

The significant aspect of our study of the bamboo and cane craft is the wide variety of ways in which the available raw material has been understood by each tribe and the manner in which this understanding has been interpreted and translated into products, each in a variety of constructions and forms to satisfy day-to-day needs.

THE MATERIALS

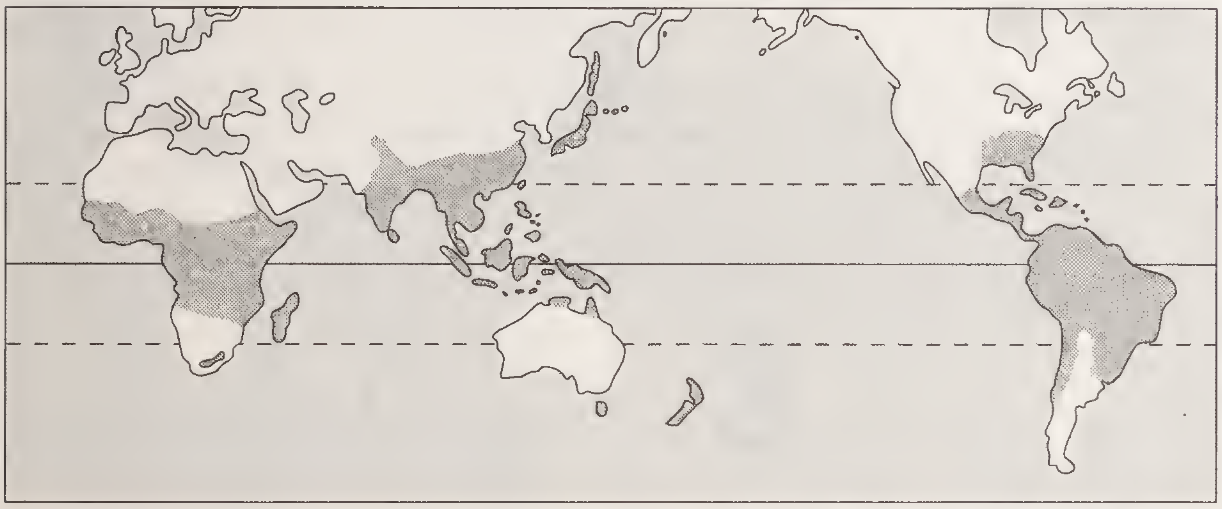
Bamboo

Culms of *Bambusa affinis* in a grove of cultivated plots in Tripura.

Growth and Distribution

Bamboos are tall perennial grasses found in the tropical and sub-tro regions of the world (fig. 20). In the order *Graminae,* bamboos belong t tribe *Bambusae* in which there are about 50 genera and 700 species. Of 136 species are found in India (figs. 21-23).

The characteristics of bamboo vary from species to species. General stems—called culms—are cylindrical, woody and jointed. A majority of species have hollow stems, but a few of them are solid. These are calle male bamboos. There is a large variation in the size and quality of stem the same species, depending on where it grows. Stems may be large and when grown in moist, fertile climates and small and solid in dry, sandy The plant has an ability to withstand dry as well as cold climates, and s species grow at altitudes as high as 3,000 metres. The stems range from



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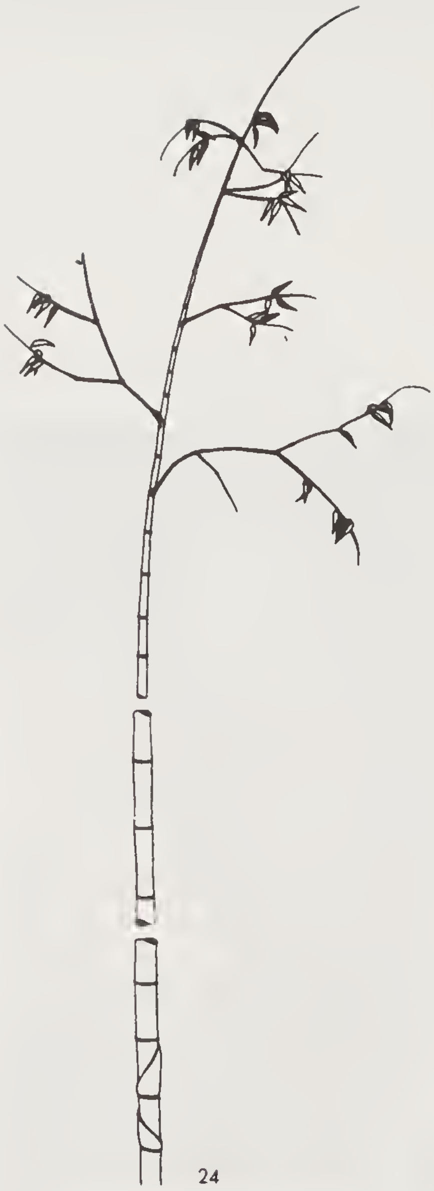
20: A world map showing native bamboo growing areas.

21: Clumps of bamboo at Silchar.

22: Culms of the *bholuka bans* at Amguri.

23: The culm and branches of *jati bans*.



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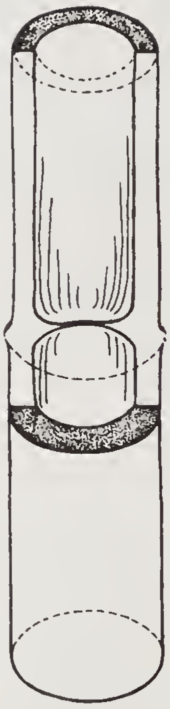

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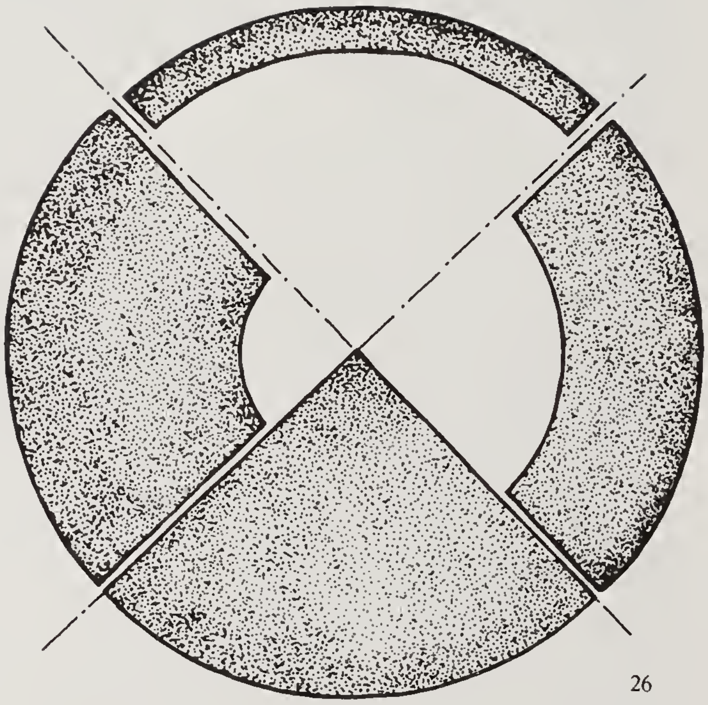

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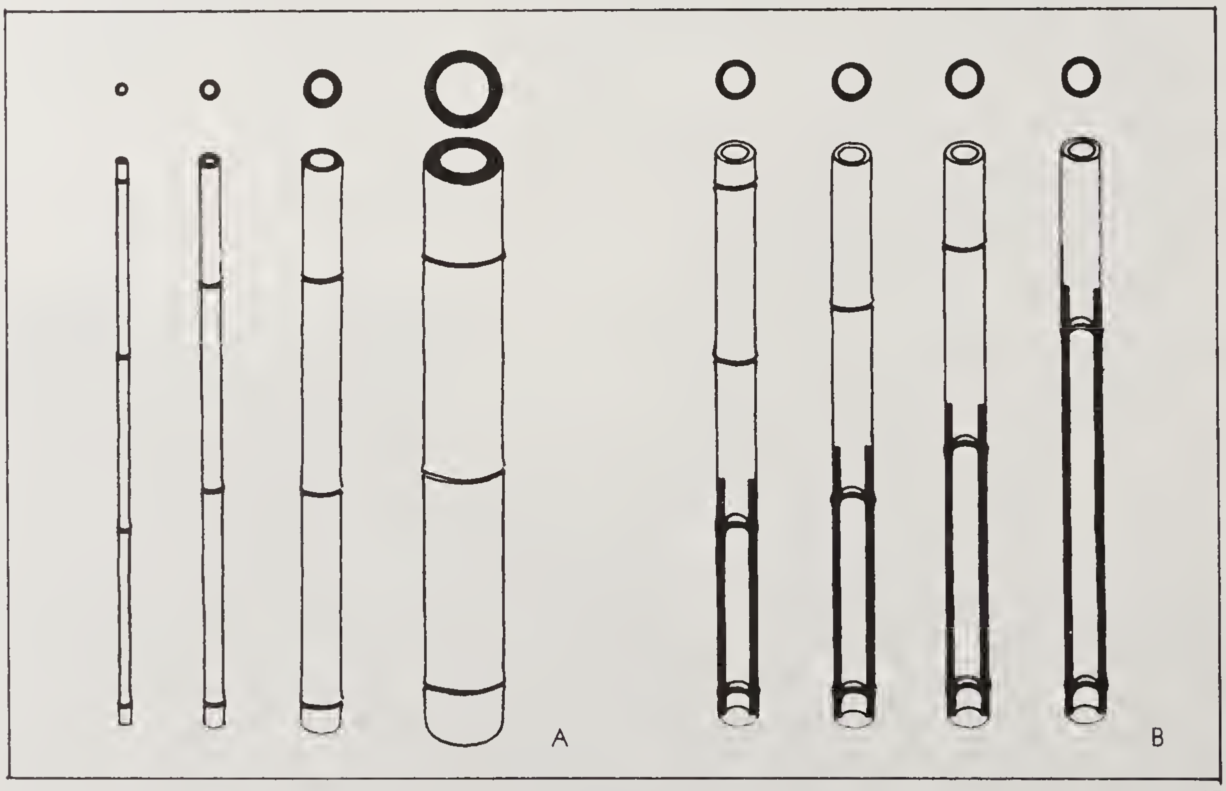

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24: Parts of a bamboo culm; upper segment with branches and leaves, middle segment showing nodes and internodes, basal segment with culm sheaths.

25: Cutaway view showing node, internode, lumen and wall thicknesses of a bamboo culm.

26: Variations in wall thickness in different species of bamboo.

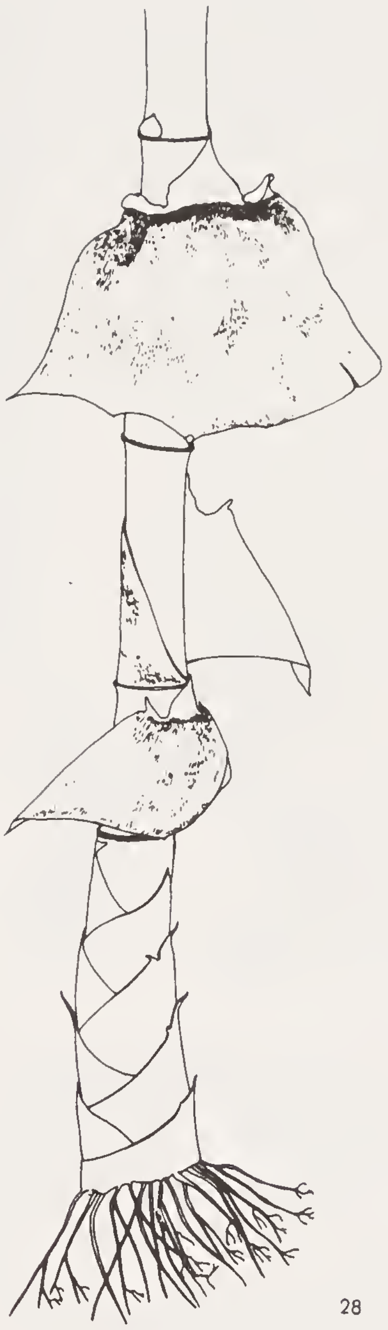
27: Diverse physical characteristics of bamboo culms of different species: (A) variations in diameter (B) variations in internode length.

12 mm in diameter and 450 mm in height to 300 mm in diameter and 30 metres in height. The leaves are flat and lance-like and the flowers grow in dense clusters at the end of a branch, or hang loosely all along the branch. The fruits are small, like nuts or berries, or like grains of paddy.

The Culm

Bamboo culms are cylindrical stems which stand tall and tapering at the top with the maximum diameter at the base (fig. 24). They are hollow cylinders which are rhythmically divided by transverse walls at nodes which appear as a slight swelling on the surface of the cylinder. The parts between the nodes are called the internodes and the hollow space within is called the lumen (fig. 25). The culms are commonly erect, though in some species they are scandent or climbing. Branches and leaves grow out of the nodes, generally towards the upper part of the culm.

Culms of different species of bamboo have diverse physical characteristics. These are reflected in the variations in diameter of culm, height of culm, wall thickness of internodes, size of lumen, length of internodes, branching pattern, and so on (figs. 26, 27). The most significant variation seems to lie in the shapes of the culm sheaths which are attached to the nodes till the culm attains maturity. The culm sheaths protect the shoot during growth as they are composed of a tough, fibrous material. They cover each internode and are shed on the culm attaining maturity (fig. 28). The culm sheath plays a major role in the botanical identification of species of bamboo (fig. 29). Bamboo flowers are another means of identification. However, as the flowering is erratic these are not easily available for identification. Bamboos are gregarious. The culms grow in clumps which are either densely caespitose (clustered) or diffuse. Hence, the spatial relation of individual culms in a clump may be densely packed together or appear as individual culms standing well separated from surrounding ones. The clump habit of a particular species of bamboo is determined by the type of root structure manifested in that species (figs. 30, 34).



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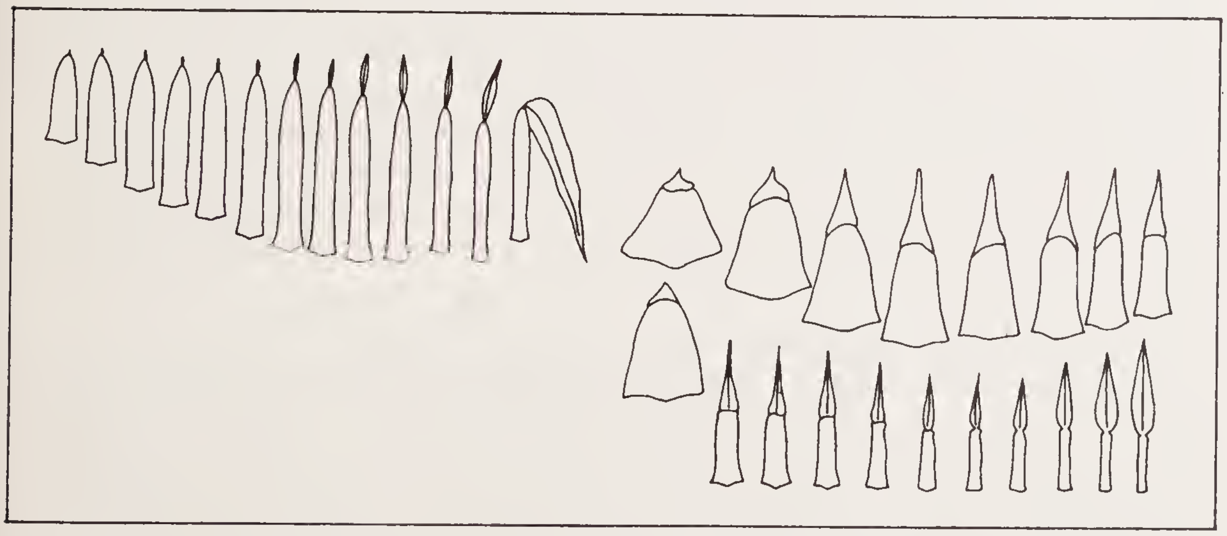
28: Culm sheaths attached to the basal segment of a bamboo culm.



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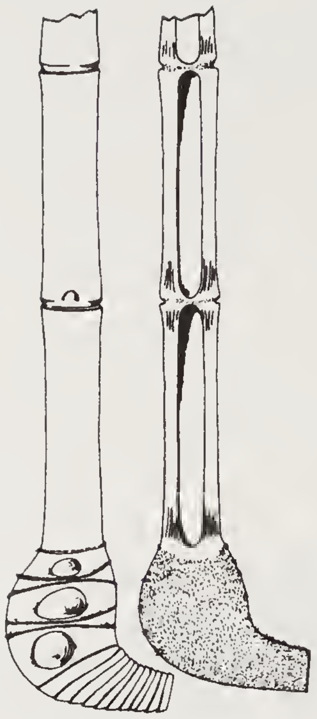
29: The progressive changes in successive culm sheaths shown for two species, left and right.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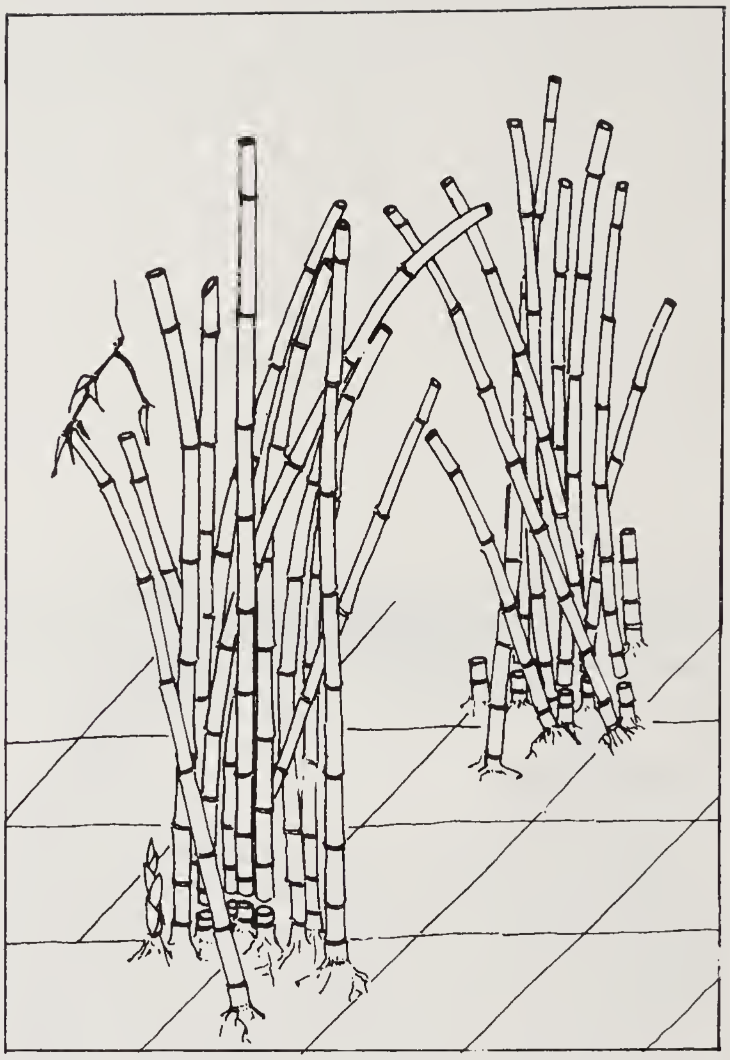
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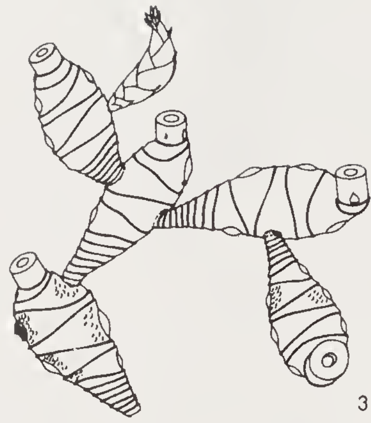
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30: A schematic diagram of the clump formation from a *pachymorph* root structure.

31: A *pachymorph* rhizome system.

32: A *pachymorph* rhizome and culm.

33: Section of a young bamboo shoot.

The Rhizome

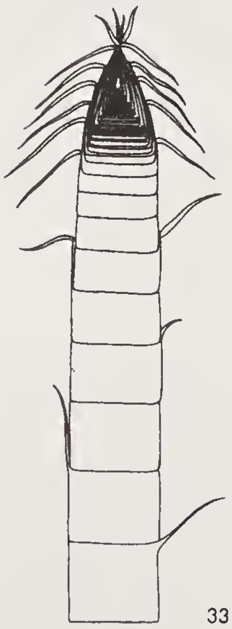
Bamboo culms grow from underground stems called rhizomes of which there are basically two types: the *pachymorph* and the *leptomorph*.

The *pachymorph* rhizome is typified by the following characteristics: it is generally short, asymmetrical, and curved in a spindle shape such that the maximum diameter of the rhizome is larger than the culm that grows from it (fig. 31). It is solid, with the breadth of the internodes wider than the length. The nodes are not prominent. There are two types of buds that grow out of the rhizome. Lateral buds that grow into other rhizomes, and a bud at the apex that grows into a culm. The part of the rhizome that connects it to its parent rhizome is called the rhizome neck. Densely caespitose clumps of bamboo are formed when the rhizome neck is very short. In other cases the culms grow separately. This happens when the neck of the rhizome is long, growing horizontally for a distance before it turns vertically upwards to form a culm.

The *leptomorph* rhizome has the creeping habit (fig. 35). These are long horizontal runners with lateral buds, most of which grow vertically to form culms. A few grow laterally to produce other rhizomes. As opposed to the *pachymorph* rhizome, *leptomorph* rhizomes are long and slender and more or less cylindrical (figs. 32, 36). They are generally hollow, with the small lumen periodically interrupted by nodes. The diameter of the rhizome is usually less than that of the resulting culm. The end of the *leptomorph* rhizome rarely turns upwards to form a culm.

Other rhizomes are variations of the two mentioned above. Some *leptomorph* rhizomes produce lateral buds that may grow either into *pachymorph* rhizomes or *leptomorph* rhizomes.

One feature incident in any bamboo species (irrespective of the type of rhizome manifested) is tillering. This means that fresh culms grow out of buds at the base of a mature culm without an intervening rhizome.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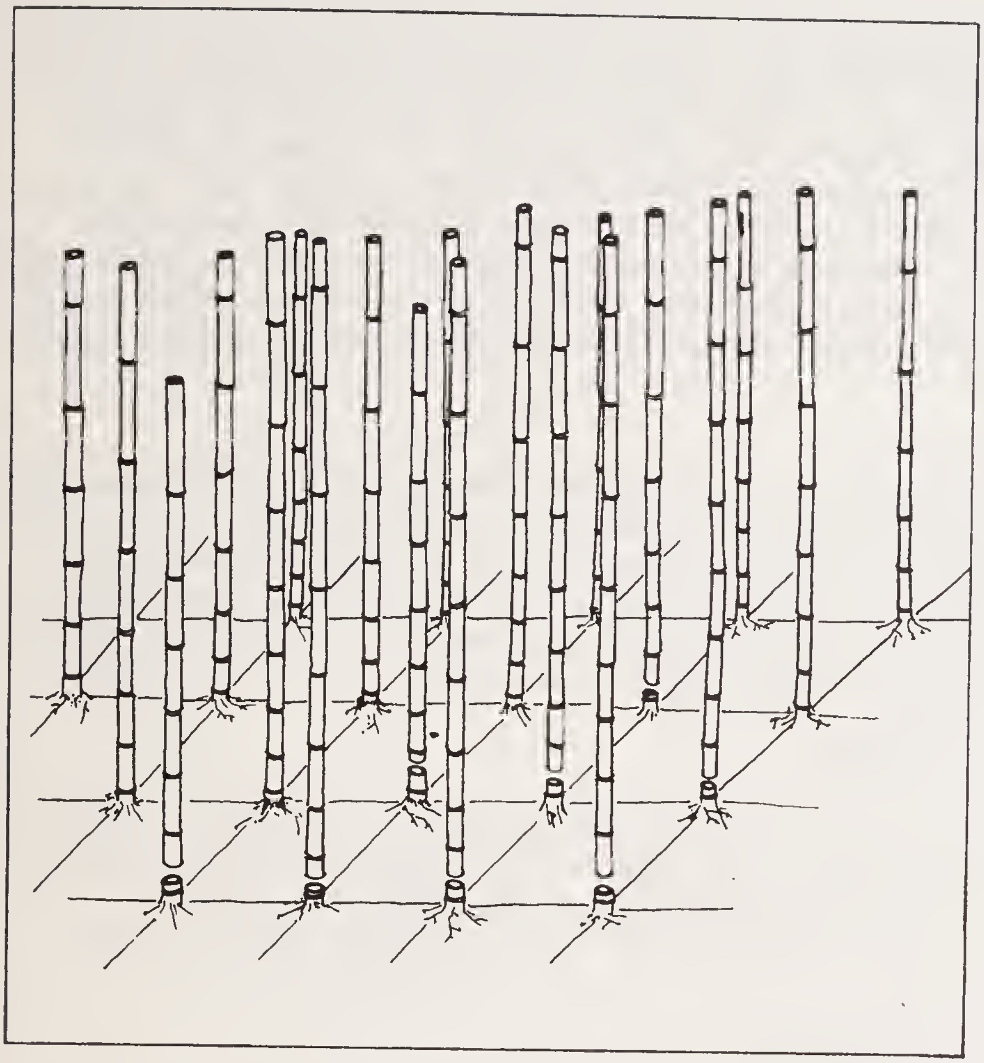
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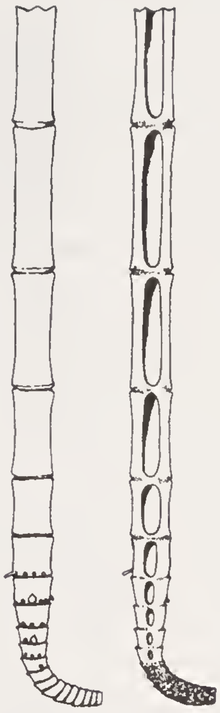
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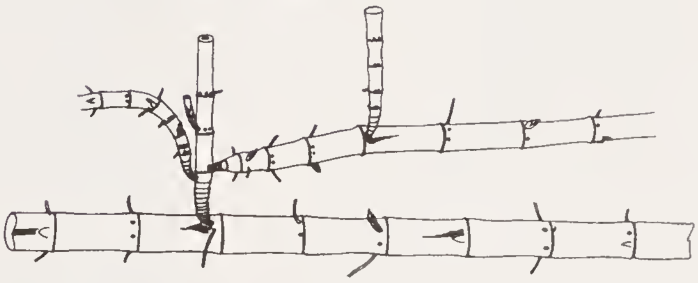
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34: A schematic diagram of the clump formation from a *leptomorph* root structure.

35: A *leptomorph* rhizome system.

36: A *leptomorph* rhizome and culm.

37: Cross section through the wall thickness of a bamboo culm.

Growth

Bamboo shoots grow during the monsoon. They are miniature culms, in which all the nodes and internodes are represented (fig. 33). The shoots grow to their maximum diameter as soon as they are above the ground. This characteristic enables the growing culm to penetrate the tangled growth of the mature culms in the clump. The culm attains its maximum height within four to five months in the first growing season. The rate of growth is high, generally 60 mm to 200 mm a day, and some species grow as much as 900 mm in a day. Branches grow generally from the upper nodes. Lignification or hardening of the culm occurs within two to three years and maturity is attained in an average of five years. The culm sheaths that grow at the nodes fall off once the culm matures.

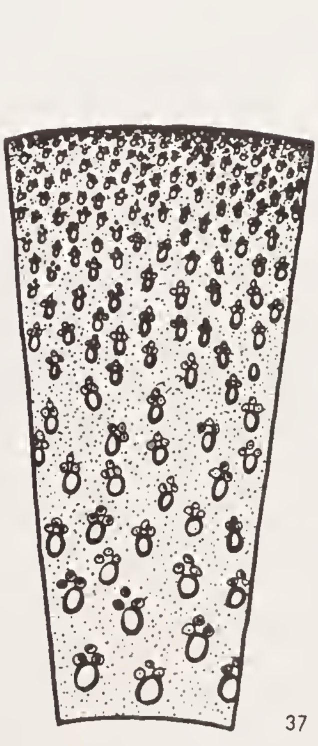
Anatomy

The culm consists basically of two types of tissue—*prosenchymatous* and *parenchymatous.* The *prosenchymatous* tissue consists of xylem vessels that carry watery sap, phloem vessels that conduct the food solutions, and the thick-walled fibres. All these together make up the fibrovascular bundles which run vertically in the internodes.

The *parenchymatous* tissue constitutes the ground mass in which the fibrovascular bundles are arranged. The *parenchymatous* cells store starch and all cells are vertically oriented.

The fibrovascular bundles towards the inner wall of the culm consist of four groups of constituents, three of which contain xylem vessels and fibres and one with phloem vessels and fibres. Towards the periphery, three groups containing xylem vessels combine into one compact group so that there are only two groups of vessels apparent there. The bundles are smaller, more numerous and compact towards the periphery. Towards the inner wall, *parenchymatous* tissue predominates (fig. 37).

The maximum number of fibrovascular bundles are found towards the base of the culm. This is because as they ascend some of them pass into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the branches and leaves at the nodes. There is no branching of the vessels or fibres along the internodes, resulting in weak transverse bonds. The fibres constitute 60 to 70 per cent by weight of the bamboo, while the vessels make up about 15 per cent. A transverse section of the culm would show a much higher concentration of fibres towards the periphery than the inner wall. Near the base of the culm, the outer one-third portion contains the most fibres, while the inner two-thirds has more *parenchymatous* tissue. The longest and most mature fibres are found between one-fourth to half the height of the culm. Above this the fibres tend to get smaller and less mature.

The Node

The nodes are swollen and more lignified than the internodes. The transverse membrane completely separates each internode. The vessels and fibres that are unconnected in the internodes pass through the transverse wall, cross-connecting the wall of the culm. They also provide the connection between the internodes and the branches. The nodes, therefore, provide the only connection from one side of the culm to another.

Moisture Content

The moisture content of bamboo varies with the season and the age of the culm. The percentage of moisture can be as much as three times higher during the monsoon than during the dry season. The base of the culm contains more moisture than the top and the younger culms contain more than the older ones.

Flowering of Bamboo

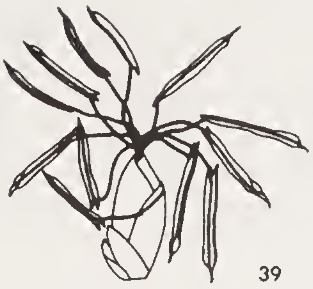
Some bamboos flower annually and some once in three years, but most of them flower once in their lifetime (figs. 38, 39). Flowering patterns differ with the species. Some flower sporadically when only a few culms blossom at a time, or gregariously where all the culms flower simultaneously. Gregarious flowering of bamboo takes place in three stages: preliminary sporadic flowering, gregarious flowering and final sporadic flowering of the remaining culms. Bamboos generally die after gregarious flowering once in their life-cycle. They release a large number of seeds that take six to twelve years to grow into mature culms. One peculiarity with bamboo is that all the culms from the same batch of seeds will flower simultaneously, whichever part of the world they may be growing in.

It is fairly well established that gregarious flowering of bamboo causes famine. The explanation for this is that the rodent population thrives and multiplies due to the sudden availability of a large quantity of seed. When the seed stock is exhausted, the enlarged rat population turns to food-grain. It is the attack on food-grain that causes famine.

Propagation

Bamboo is naturally propagated through seeds (fig. 40). Some bamboos are propagated through bulbils which are defined as a mass of vegetative cells detachable from the parent and able to give rise to a new plant. The detachment of such bulbils from the parent plant may be through wind. Once a plant and the rhizome have been established, the rhizome gives rise to shoots and other rhizomes and the plant keeps growing.

Several techniques of propagation have been developed for the purpose of systematic cultivation. Vegetative propagation is by for the most popular and effective. Whole culm segments with buds intact may be used (fig. 41). Whole culm segments with young branches and buds may also be used (fig. 42). Occasionally, single branches with a small portion of the mother culm left attached is also effective (fig. 43). Culm segments may be planted at a steep inclination with a large part of the culm exposed. Buds above ground may take root in the humid air (fig. 44).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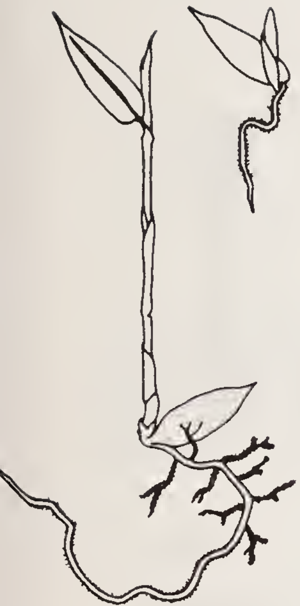
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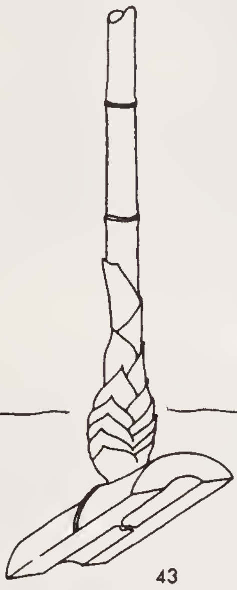
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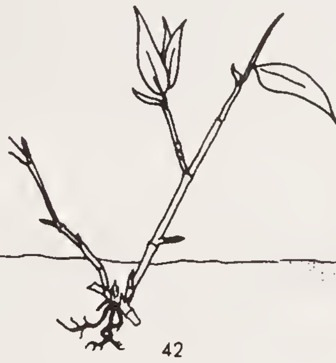
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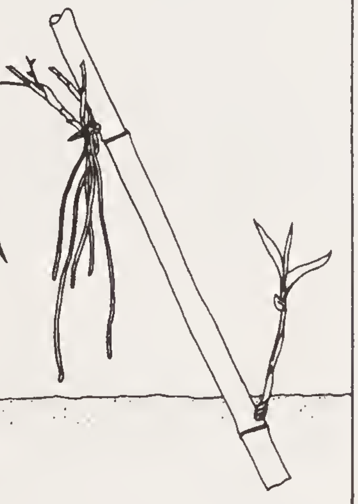
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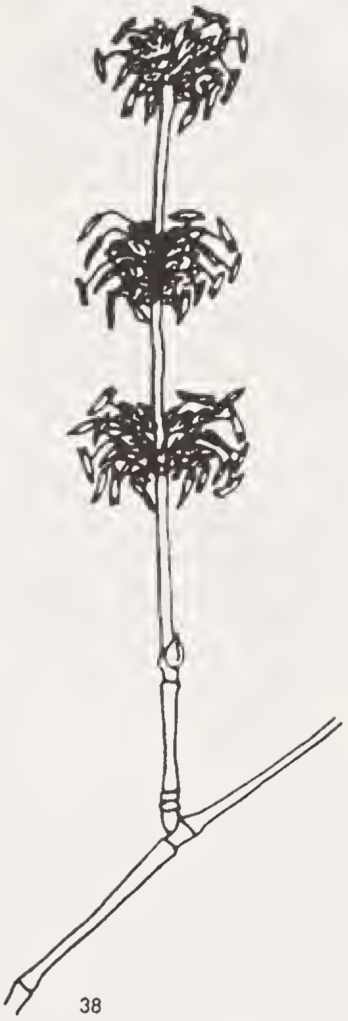
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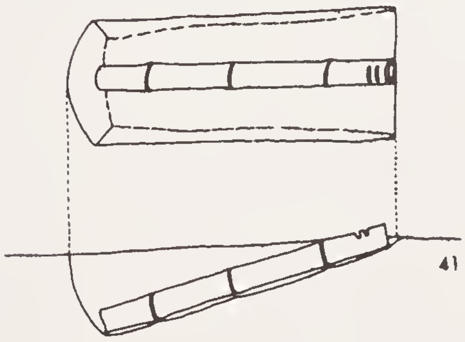
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There is a necessity for the promotion of bamboo cultivation. Particular species may need to be grown in certain areas so that these are easily accessible to craftsmen, scientists and commercial interests in the required quantities. The main advantages of any species of cultivated bamboo are uniformity in size, properties, and genetic constitution. These aspects are important for craftsmen who expect that culms of the same species behave similarly, for scientists who need to carry out experiments on a species of bamboo of similar culm sizes and genetic constitutions, and for commercial organisations who need to plan for the packing, transportation and utilisation of bamboo. (For further details on the propagation of bamboo see Appendix I.)

Properties of Bamboo

The craftsmen of the Northeast have demonstrated a deep understanding of the varied structural properties of bamboo which is used in whole or split form. The characteristics of the length-wise splits are dependent upon the portion of the culm from which they have been cut (fig. 45). The flexibility, tensile strength and durability of bamboo is always exploited to the fullest degree.

Despite the extent of the use of bamboo by local craftsmen, not much organized scientific research has been done to record the properties of different species. Neither has sufficient work been done on the study of structural properties of the numerous sections that could be generated by splitting a bamboo culm.

It has been found that the properties of bamboo vary greatly from species to species, and to some extent within a species. A United Nations report on the uses and properties of bamboo and reeds in building construction briefly sums up the general characteristics of bamboos.

The characteristics of bamboo are an outcome of its anatomy. The culms are generally long and straight, and the hollow internodes make it comparatively light. The average weight works out to 648 kg. per cubic metre. The strength of bamboo varies with the species, the age of the culm, the moisture content

38: A flowering branch of a species of bamboo.

39: A single pseudospikelet from the branch.

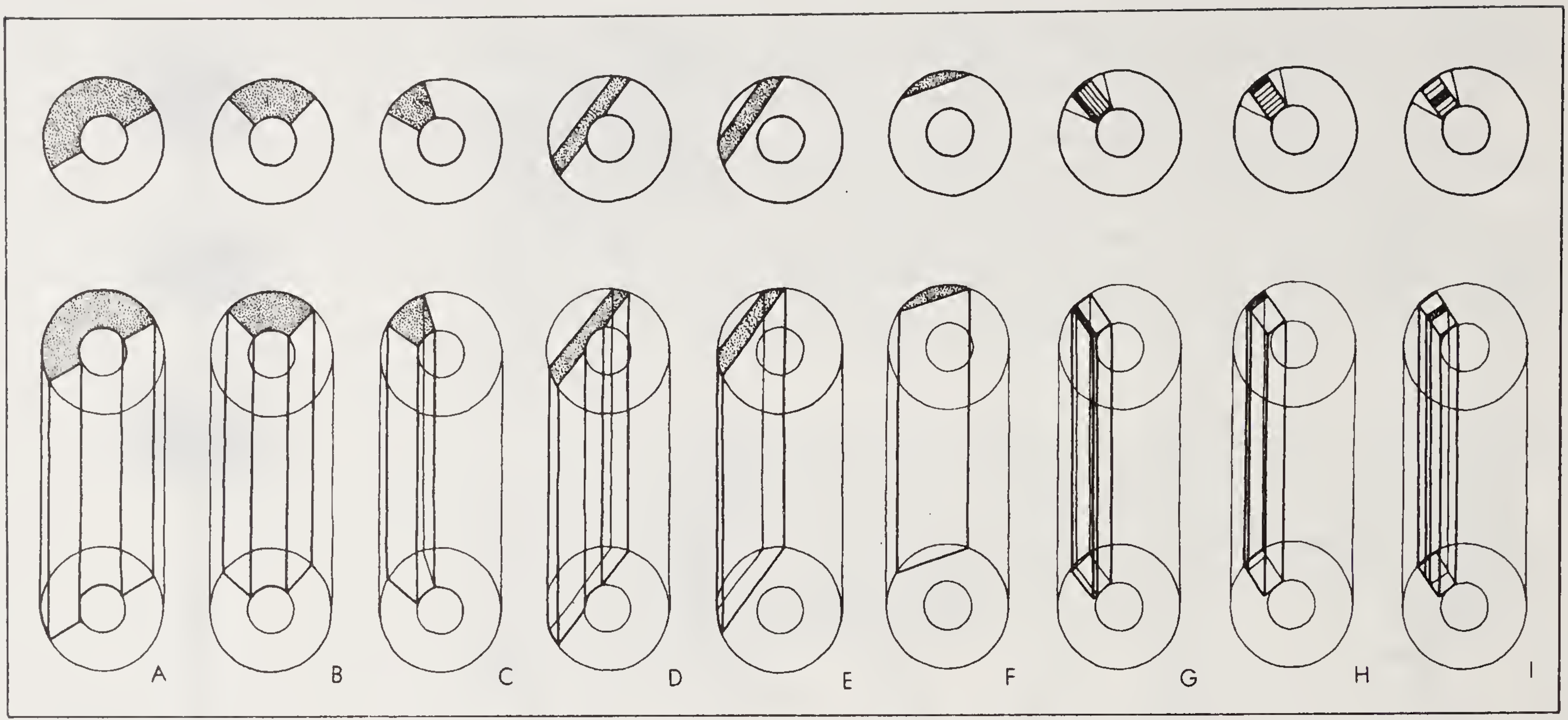
40: Seedlings in two stages of development.

41: Plan and sectional views of a culm segment with bud.

42: Roots developed under sand from a young branch.

43: Single young branch prepared for propagation.

44: Roots developed in humid air.



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45: A variety of sections or splits that are extracted from the culm, each to suit a specific purpose: (left to right) (A) longitudinal half, (B) longitudinal quarter, (C) thick splint, (D) wide inner split, (E) wide inner split, (F) wide outer split, (G) fine radial split, (H) fine tangential outer split, (I) fine tangential inner split.

and the portion of the culm used, and generally increases until it reaches maturity.

Bamboo has a high tensile strength measured parallel to the grain. *Phyllostachys bambusoides* showed a tensile strength of 2,629 kgs. per cm^2 which is superior to structural steel, with a tensile strength of 1,375 kgs. per cm^2. Bamboo fails in shear before it fails in tension and therefore the modulus of rupture is used to calculate strength. The basal portion of the culm has a high modulus of rupture due to its greater wall thickness.

Young culms with a high moisture content show a greater increase in strength when dried than older culms. The difference between old and new culms gradually diminishes by about 2½ years. The moisture content of bamboo causes it to behave like wood in relation to its compressive strength which almost doubles when the green culm is air-dried.

The transverse nodal walls affect the bending strength of bamboo, but not the crushing strength. Static bending tests show that there is higher bending strength but lower stiffness when the load is on the node than when the load is between the nodes.

Due to the weak transverse bonds between the bamboo fibres, it can be split easily along the length. The splits may be radial or tangential. The outer tangential splits of bamboo are stronger than the inner ones due to the tightly packed fibres in the periphery. Static bending tests give the best results when the outer layer is in compression for splits with and without the node.

The Forest Research Institute, Dehra Dun, has published papers on the properties and strength of one species of bamboo *Dendrocalamus strictus*.

Structural Characteristics

Specific gravity	:	0.5 to 0.79 grams per square centimetre Average 0.65 grams per square centimetre
Average weight	:	648 Kg/Cubic metre
Modulus of Elasticity		
Green culm	:	less than 1,00,000 Kg/Cm^2
Dry mature culm	:	1,25,000 to 1,95,000 Kg/Cm^2
Average	:	1,60,000 Kg/Cm^2
(One species which had been kiln-dried measures 2,25,000 Kg/Cm^2)		
Modulus of rupture	:	900 Kg/Cm^2 to 1,700 Kg/Cm^2
Average	:	1,300 Kg/Cm^2
Compressive strength	:	Parallel to grain 315 to 725 Kg/Cm^2
Average	:	520 Kg/Cm^2

Preservation of Bamboo

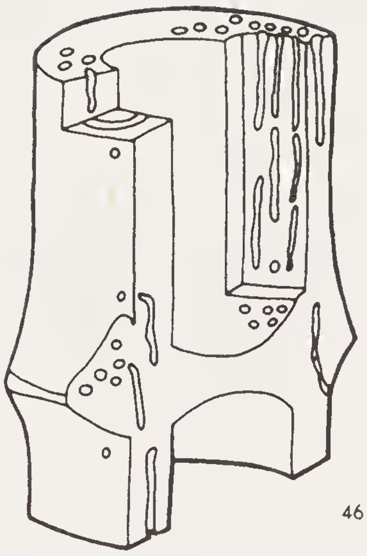
The main problem faced by the users of bamboo and bamboo products is the susceptibility of the material to attacks by termites, borers, decay fungi and moulds. These destroy the material in various ways, some eating it away and thus weakening it, others marring the surface by ugly, discoloured patches.

Termites

Termites of the animal kingdom generally destroy bamboos which are in contact with the ground, such as those used for construction purposes. Handicraft products may be attacked only if they are left unused on the ground for long periods of time.

Borers

Beetles of the *Arthropoda* group attack bamboo through cut ends, and scars on the surface. They cannot penetrate the thick waxy silica layers on the outer and inner surfaces of the culm. The beetles live within the bamboo, eating long vertical galleries that destroy its strength. On completing their life-cycles, the beetles emerge through horizontal bores that puncture the silica layers from within. The extent of destruction to the bamboo can be gauged from the number of exit holes on the surface, and the quantity of powdery bamboo that comes out from them (fig. 46).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46: Cutaway diagram of a culm showing galleries eaten out by borers.

Decay Fungi

Decay fungi belonging to the *Basidiomycetes* group generally attack bamboos that are exposed to damp conditions. They, therefore, do not affect handicrafts. In its advanced stages, the fungi is seen as brown or white rot, that completely destroys the strength of the bamboo.

Mould Fungi

Mould fungi belonging to the *Thallophyta* group live on decaying and dead matter and are therefore a threat to bamboo products. They particularly affect handicrafts as they mar the surface with pock-marks and ugly brown, black, green and orange patches.

The growth of the fungi is affected by food, light, temperature and humidity. Apart from water and oxygen, which are essential to their growth, the food requirements of these fungi is very low and, with the exception of carbon, they thrive on a number of inorganic substances. Different species of fungi need different light conditions for growth—some survive in darkness while others need bright light. Moderate light conditions generally seem to encourage the growth of the fungi. Temperature also affects various species differently, and the range is from below freezing point upto 60° Centigrade. *Pencillium* and *Aspergillus* are the commonest species that thrive in temperate climates from 25°C to 37°C. Atmospheric humidity is very important for the growth of fungi, though the moisture content of the bamboo itself is inconsequential. The minimum relative humidity required for growth varies from 75 to 95 per cent, depending on the species.

Methods of Preservation

There are four basic approaches to the preservation of bamboo:

1. The raw material used can be inherently resistant to fungus and borer attacks. However, there is a lack of information about the behaviour of various species in this regard.
2. The continued sterility of a once-sterilised product can be ensured. This concept poses a problem in the case of handicrafts.
3. The material can be kept in physical conditions that could limit or prevent insect and fungus attacks. In handicraft products a water-repellent coating helps to check the growth of moulds.
4. Toxic substance that are antiseptics or preservatives can be used to limit or prevent the growth of moulds.

The last approach has been found to be the most effective solution. (Various preservatives and methods of application are described in detail in Appendix II.)

Preservatives

Preservatives and antiseptics used for bamboo are not necessarily fungicides and pesticides. They are toxic substances that check insect attack and the growth of fungus. Fungus spores are generally very resistant to toxic chemicals. However, the chemicals that kill the spores are unsuitable for handicraft products because they have an odour, they discolour and corrode the product, and they may be poisonous to human beings. The effectiveness of the preservatives is controlled by factors such as the availability of nutrients present along with a preservative, the humidity, the concentration of the preservative, and the duration for which the treatment is carried out.

In most cases, if the atmospheric humidity is high, the preservative needs to be more concentrated in order to be effective. A number of preservatives are effective in normal conditions of humidity, but become entirely useless when the humidity exceeds 98 per cent. Some preservatives, when used in low concentrations, actually stimulate the growth of fungus. Higher concentrations of the preservative only cause a delay in the germination of spores, and only very concentrated solutions actively prevent growth.

An Ideal Preservative

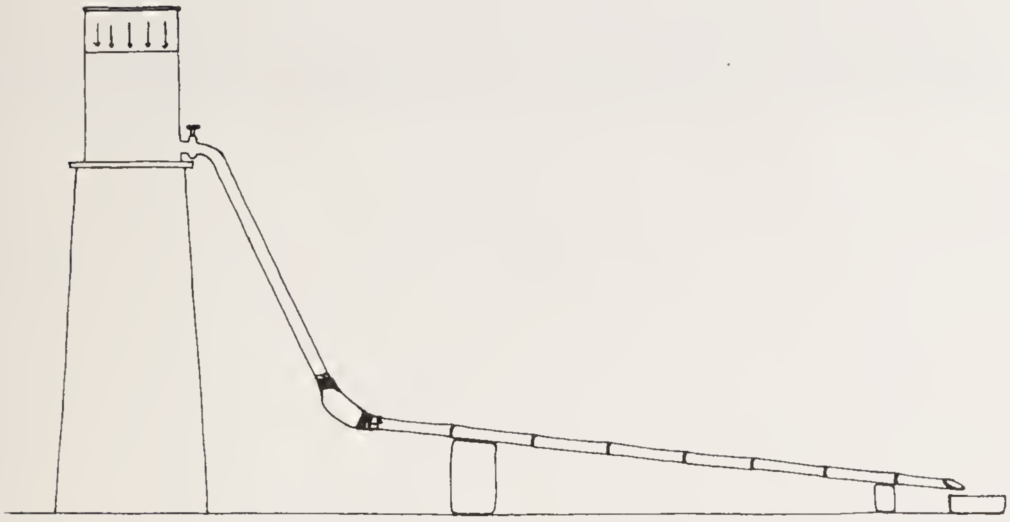
An ideal preservative for bamboo should have the following characteristics:

1. It should be highly toxic so that it can be used in low concentrations, but the toxicity should only affect fungus and insects. It should not in any way harm the people who would be using the bamboo products.
2. It should remain effective under varied service conditions.
3. It should have the ability to penetrate deeply throughout the cross-section of material.
4. It should be stable, without decomposing at extreme temperatures, and should not react adversely with the chemical constituents of bamboo.
5. It should be cheap, easily available, and capable of being used in simple treatment processes.
6. It should not weaken the bamboo or cane.
7. It should not mar the natural surface sheen, and should enable the material to be painted, if required.

These are the characteristics desirable in a preservative, but compromises often have to be made between them, depending on the conditions under which the product is to be used.

Chemical Classification

The preservatives used for bamboo may be broadly classified as oil-based, water-soluble and leachable, water-soluble and non-leachable, and those that are used in organic solvents.



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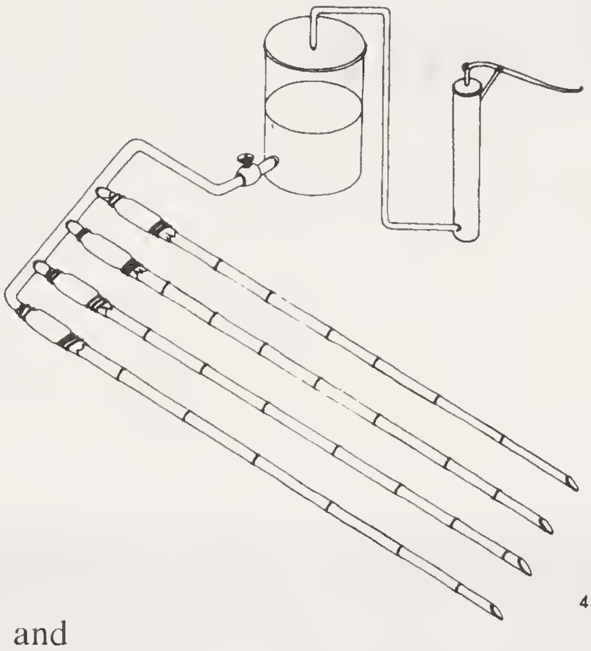

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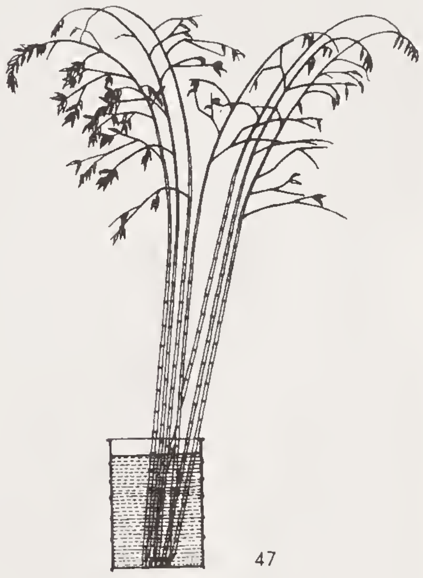
Methods of Application

The main objective of all treatment processes is to get an adequate and uniform distribution of the preservative in the bamboo, in the most economical way. There are several treatment processes, and each has its own advantages within given constraints.

There are basically two methods of treatment, those that do not require external pressure to induce them into the material, and those that need a pump or some other additional pressure to ensure effective treatment. The former non-pressure methods are easy to carry out, while the latter require special equipment.

Non-pressure methods include steeping, where freshly-cut culms are made to stand in a preservative for one to two weeks and the solution is drawn up as the leaves dry (fig. 47). Pressure methods include capping, in which the culm is connected to a reservoir of preservative by a rubber tube (fig. 48). In another pressure method, the modified boucherie process, several culms are connected to a system of tubes linked to the preservative reservoir and the pressure of a small hand pump enhances the rate of feed of the preservative (fig. 49).



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47: The steeping method of preservation.

48: The capping method of preservation.

49: The modified boucherie method of preservation.

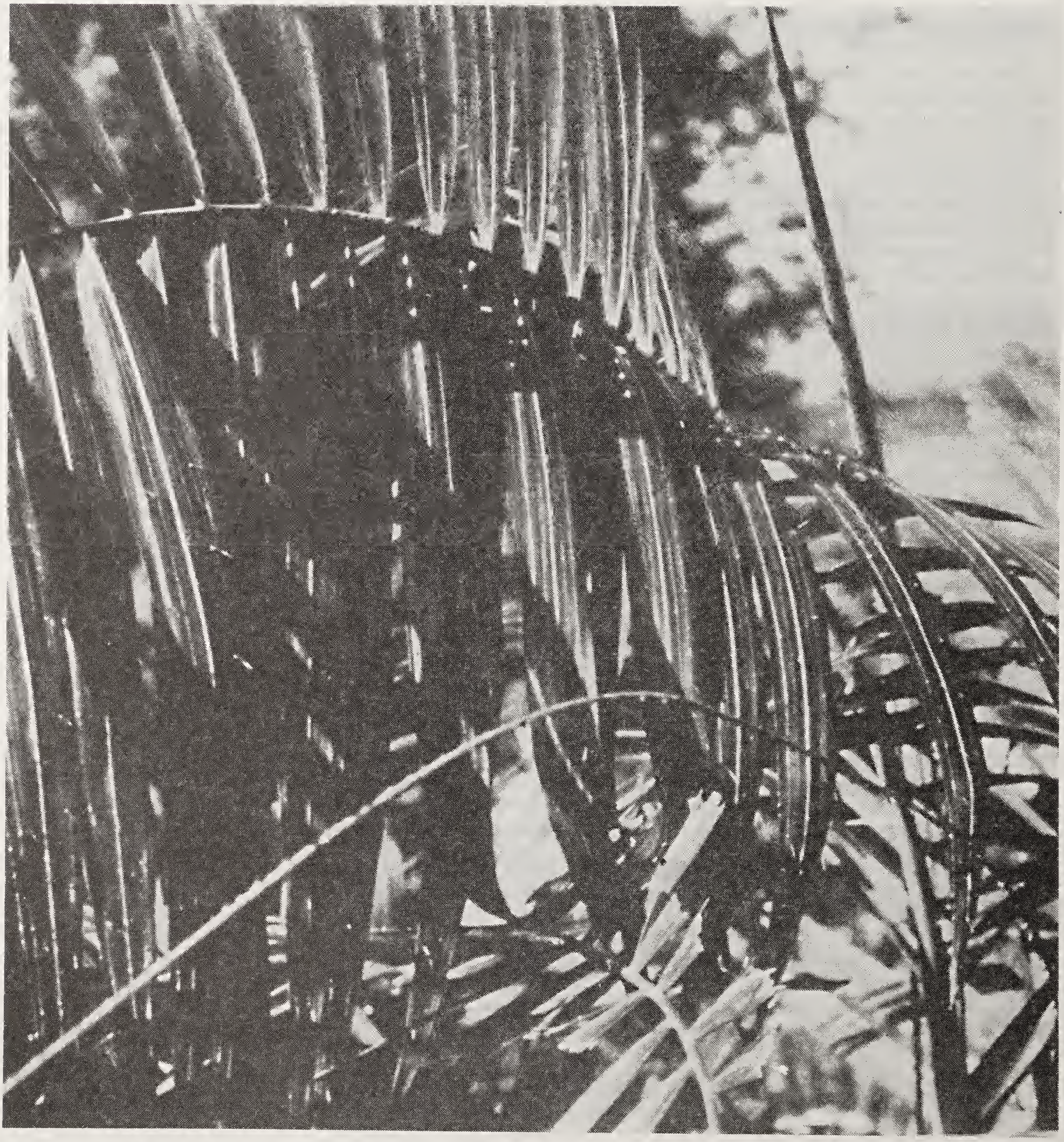
Precautions While Storing Bamboo

In addition to all the methods of preservation, insect and mould attack on stored bamboo culms and handicraft products can be minimised by a few precautionary measures.

Bamboo, cut at a time when the starch and sugar content of the culm is at its lowest, should be stored on raised platforms in well-ventilated warehouses. The floors of the warehouses should be so constructed as to keep insects away. Hydroscopic chemicals such as raw lime should be used to keep the humidity low. The surroundings should be kept free of any organic waste materials that may activate the growth of bacteria. The stored bamboo and products should be regularly sprayed with appropriate pesticides, and an inspection of the material should be carried out periodically to weed out infected products and prevent any mould or fungus from spreading.

As mentioned earlier, bamboo is extremely susceptible to borer and fungus attacks, and while the preservatives and methods of treatment are effective to some extent, they cannot provide total protection. In fact, the conditions in which they are used largely determine their effectiveness. Situations have been known where the preservative is effective in the place where the treatment is carried out, but becomes ineffective when faced with new types of fungus that may exist in the place where the product is used. This must be kept in mind while choosing an appropriate preservative.

Cane



Growth and Distribution

Canes or rattans are long, slender stems of certain trailing or climbing palms (fig. 50). They are rated as minor forest products, in spite of the fact that they are probably the most important forest products, after timber. They belong principally to the palm family of the genus *Calamus*, but a few other related genera like *Daemonorops, Ceratolobus, Plectocomia* and *Korthalsia* yield canes of lesser importance. The genus *Calamus* consists of about 390 species found in the evergreen forests of the tropical and sub-tropical regions, of which 30 species occur in India, distributed chiefly in the Himalayas, Assam, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Meghalaya, Kerala, Karnataka, Tamil Nadu and the Andamans.

In wet, tropical, evergreen forests, canes form impenetrable thickets generally with a few tall trees standing over them. Some stems are erect, but most are typically trailing or climbing and may be upto 200 metres or more in length. Once the creeping canes are in possession of a site, it is almost impossible for trees to push through. They require a constant and abundant water supply for optimum development. A few species remain in bush form throughout their lives. Canes are usually cylindrical and of uniform thickness, solid, straw-yellow to brown in colour, and are more or less covered by spiny leaf-sheaths. The diameter varies in different species from 3 mm to about 60 mm. The internodes vary in length and thickness in different species and even in different plants of the same species. The core of the stems, which are soft and spongy, are made up of coarse fibres. The surface is hard, smooth and shiny due to a deposit of silica.

The modified hooked leaflets all along the stem are five to 10 cm long. They are woody, bent acutely backwards and viciously sharp. The hook-like spines in the petioles of the pinnate leaves, and the hooked leaflets enable the plant to climb over other tropical vegetation for long distances.

Canes have been exploited by man for centuries. Their properties of toughness, strength, flexibility and elasticity have made them useful for many purposes. Whole canes are used for furniture, hats, baskets, walking sticks, and fishing rods. In some areas suspension bridges are made entirely of cane. Cane splits are used for basketry, rattaning furniture and extensively for tying and binding.

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50: *Jati* cane growing near Gauhati.

Growth and Harvesting

The growth of canes for the first few years is slow, as in all palms. At first they are erect and small, and later start climbing or trailing. One or several shoots may arise from a single root. Certain species of cane may be harvested after about six years, depending on the conditions of growth. Most clumps do not come into full bearing until their 15th year, by which time there would be about 50 or more stems, averaging 24 to 33 metres in length, as in the species *Calamus caesium.* Of these, one-tenth may be harvested every two or three years. The quality of the first harvest is not very good, but subsequent collections are of better quality.

The best season for harvesting canes is from November to March. This must be done carefully so as to avoid damage or death to the clumps. When the leaf-sheath is loose, and the lowest part of the stem is exposed, the cane is considered ripe for harvesting. Mature stems are cut at the base, and pulled by hand from their lofty perches on the crowns of supporting trees. The soft terminal portion of the stem is discarded. The sheaths are removed with a knife or by dragging them against the trunks of trees with a rough bark or by bending at the nodes. If the stem is bent at the nodes, the sheath snaps, and can easily be removed. The stems are cut to standard lengths and dried in the sun. They deteriorate quickly if they are not properly dried soon after harvesting. If the weather is wet, they should be seasoned near a fire. Thicker varieties of canes are cut to standard lengths of four metres. Thinner canes are cut in lengths of six metres which are then folded and tied into bundles for easy transportation.

Processing of Canes

In order to obtain good quality canes, it is essential to process them properly after harvesting. The imported Malayasian canes are often superior to Indian canes on account of their good colour, smoothness, flexibility and durability. This superiority is mainly due to correct methods of harvesting and processing. The methods adopted for processing canes are as follows:

Collection

Canes are considered to be ripe for harvesting when the leaf-sheath starts loosening and the lowest part of the stem is exposed. The top two metres of the shoot is discarded as it is soft, tender and unfit for use. The remaining portion is cut into standard lengths, dried, and treated in various ways (fig. 51).

Desilication

The silica layer is removed by rubbing the freshly-felled cane over a knife or a sharp piece of bamboo set in an upright position. The same effect is achieved by rubbing the stem against a tree with a rough bark. Alternately, the cane may be steeped in water, straightened out, rubbed with sand and dried.

51

51: A cane drying yard at Dimapur.

Bleaching

After desilication the cane is bleached in order to obtain a fine creamy colour. This is generally done in the forest by fumigation with burning sulphur (½ kg. of sulphur is required for 250 kg. of canes). This fumigation probably also helps to provide some protection against insect attack.

Polishing

After desilication and bleaching, the canes need to be polished to restore the lustre which is lost during the former processes. The stems are polished with soap-stone, or with a woollen rag which has some siliceous hairs from the leaf-sheaths of bamboos placed on it.

Smoking Treatment

Some of the Malacca canes are treated by smoking over a fire and then polishing them with coconut oil. This process gives them a fine reddish-brown colour.

Grading

After processing, the canes are graded and sorted according to colour and thickness. They are tied together in bundles of 100, and stored for marketing.

Propagation of Canes

In the northeastern region all the canes that are harvested are naturally-growing canes from the tropical rain forests on the hill slopes. In places like Arunachal, Nagaland, Meghalaya, Manipur and Mizoram naturally-growing cane is abundantly available; however, this is not the case in Tripura even though it has a suitable climate. There is a need for the cultivation of various species of cane in places easily accessible to craftsmen. This could ensure a supply of good quality canes.

Canes thrive best in a compost of equal parts of sandy loam and humus formed by decomposed leaves. They require a warm, moist atmosphere and abundant watering. Water-logged areas or lands subjected to frequent inundation are not suitable for the cultivation of cane. Canes grow naturally in well-drained soil in light forests, along the edges of streams and fresh-water swamps. Therefore, areas around perennial streams and marshes may be utilized for its cultivation.

Cane plants are raised through seeds. It is important that the seeds be fully mature, and for this it is necessary that the fruit be completely ripe when they are collected, i.e., when the skin is yellow-white and the fruits fall easily on slightly shaking the plant. The pulp is removed by rubbing it with wood ash, which has been found to prevent destruction by ants. The seeds are sown fresh, as they appear to deteriorate when old. Propagation of cane by rooted suckers has also been attempted, and it has been found successful when these are planted in July during the monsoon.

Before sowing, it is advisable to soak the seeds in water for a few days. The soil of the seed bed is carefully loosened and cleaned of leaves and roots. Sowing should then be done, preferably at the beginning of the monsoon, in beds which are protected by a light thatch as too much sun is unfavourable for germination. The seeds are sown five to 10 cm apart, covered with a light layer of soil, and kept well watered. Germination may start in about 14 days, the young leaves appearing about two months thereafter. Normally, however, germination takes upto about six months. Experiments at Dehra Dun have shown that although a few seedlings may come up within a month of sowing, more seedlings come later on and the seeds go on germinating even when they have been in the soil for about 12 months.

One-year-old plants, about 15 cm high and bearing four to five leaves can be transplanted with a ball of earth during the rains. Care must be taken not to plant them too deep, as the seedlings may be suffocated. The area should have large hardwood trees scattered for shade and support. Planting in the open results in failure. Trees with small crowns and roots that do not spread much are desirable.

The seedlings are planted in strips about 6.5 metres apart. The strips, 1 to 1.5 metres wide, are cleared of weeds and bushes, but the existing trees are not felled. The seedlings are planted in these strips in groups of two or three, the distance between the groups being 6.5 metres. If the seedlings are planted in the middle of these strips, there is a danger of wild animals trampling upon them. It is therefore recommended that the seedlings be planted near the edges of the strips and not too close to the stems of the shade trees.

For the first two or three years, occasional loosening of the soil around the clumps and mulching the clumps with humus encourages the growth of canes. After this they may be left to nature. The young plants do not require much light in the beginning, but after the second year more light can be given by clearing the area around the young plants. They will then begin to climb the shrubs and trees.

THE
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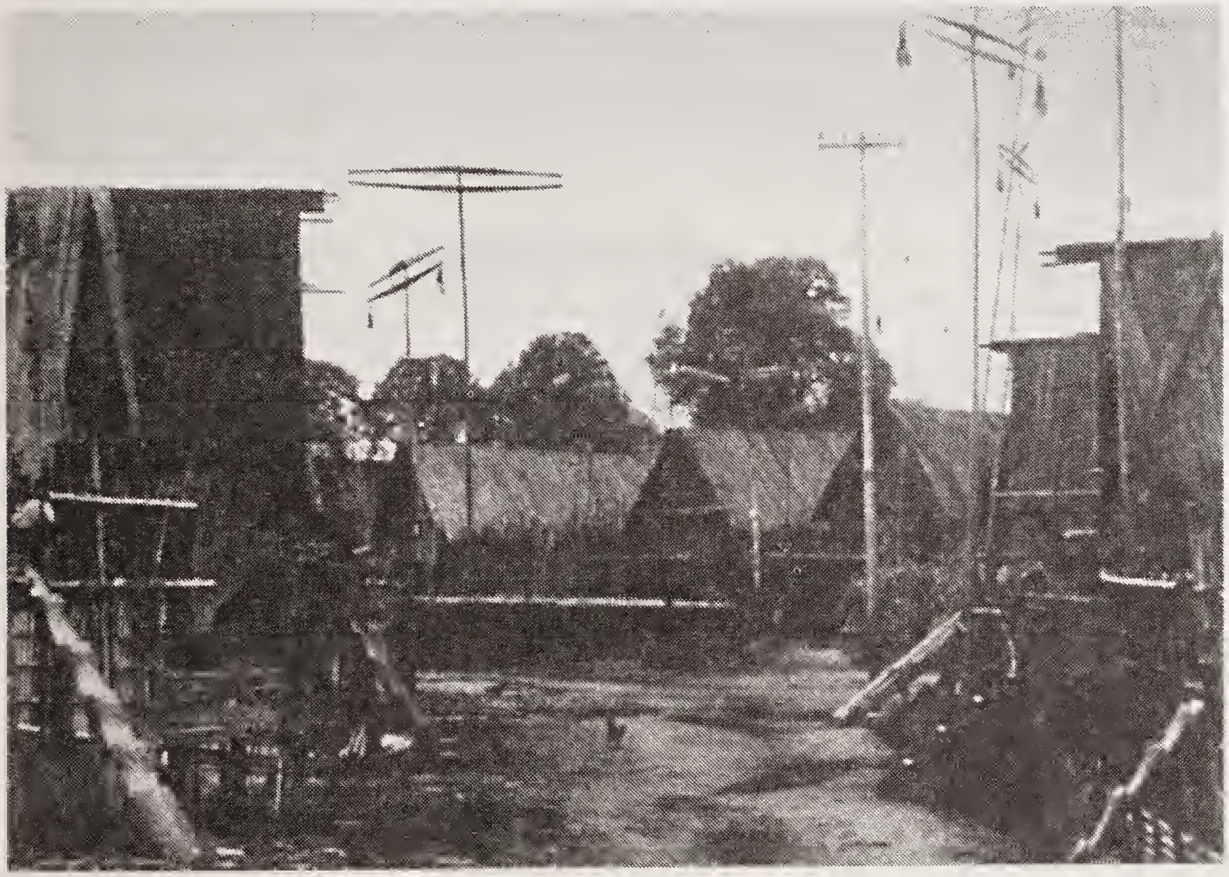
Bamboo Architecture

In the Northeast, where access is difficult, people have had to rely on locally available materials for architectural purposes (fig. 52). This has resulted in the ingenious use of bamboo and cane for the construction of bridges, houses, fences, stiles and gates. The tribal hill houses are generally built along slopes, and made entirely of bamboo bound with cane. Varying lengths of bamboo posts, which compensate for the sloping ground, are used to create horizontal floors for the houses. In the plains of Assam the ground-level dwellings are made from bamboo together with other materials.



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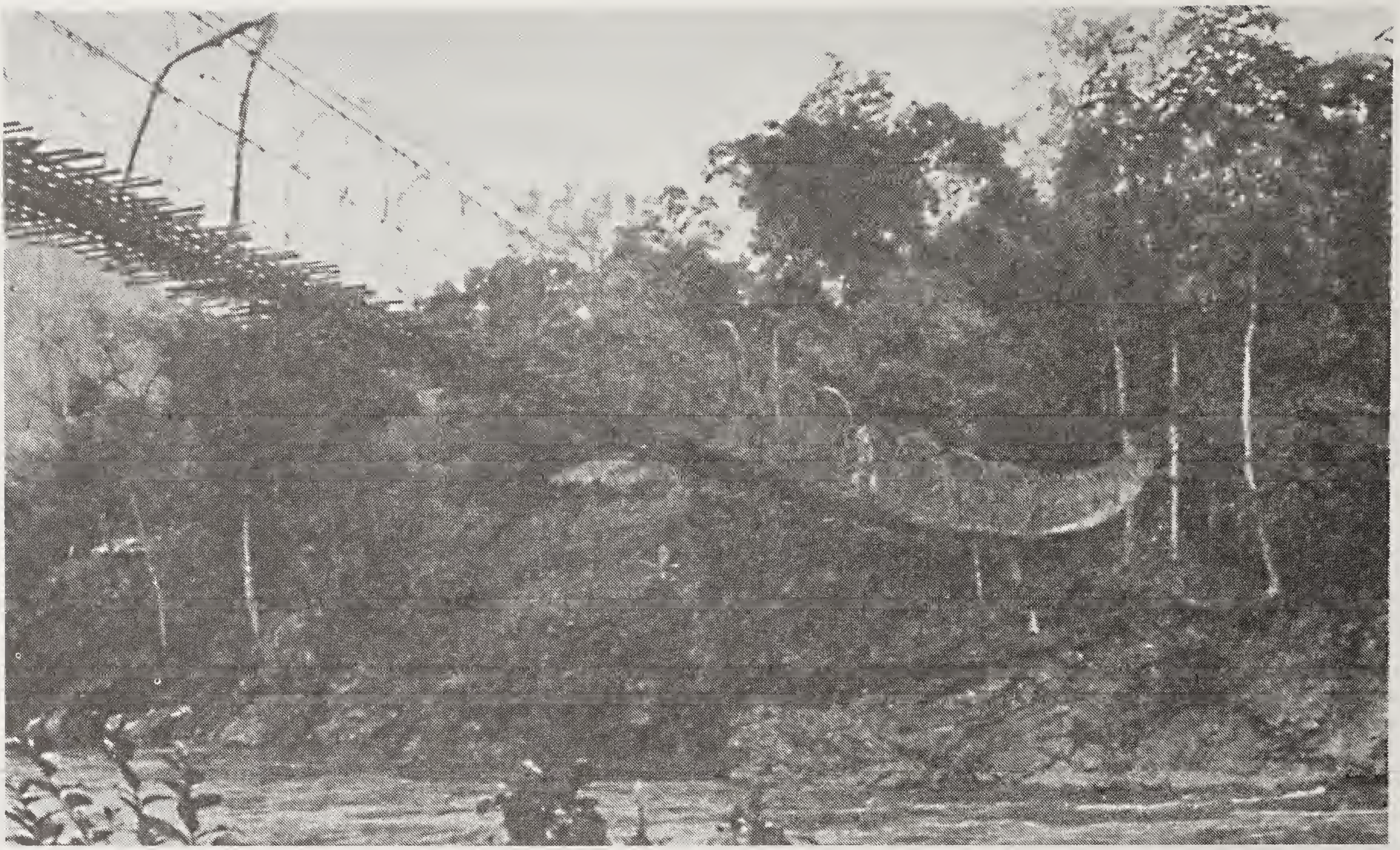
52: A typical Apa Tani village.

Suspension Bridges

In their writings about their journeys, travellers from China crossing the Himalayan range into India have referred to suspension bridges of cane and bamboo built by the hill tribes of the northeastern region. These references date back as early as the 11th century A.D. Several references to such bridges appear in the writings of the British administrators who lived in the region during the period of British rule. From these accounts it is clear that several tribes including the Abhors (Adi), Hill Miris, Daflas (Nishis), Monpas, and Akas of Arunachal Pradesh as well as several Naga tribes had mastered the technology of building suspension bridges of cane and bamboo. Even today cane and bamboo suspension bridges are the only means of



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53: Cane suspension bridge at Pangin as seen from the south bank.

54: The bridge as seen from the river bed.

55: Walking through the web-like structure. Note the bamboo walkway.

56: The approach ladder to the bridge.

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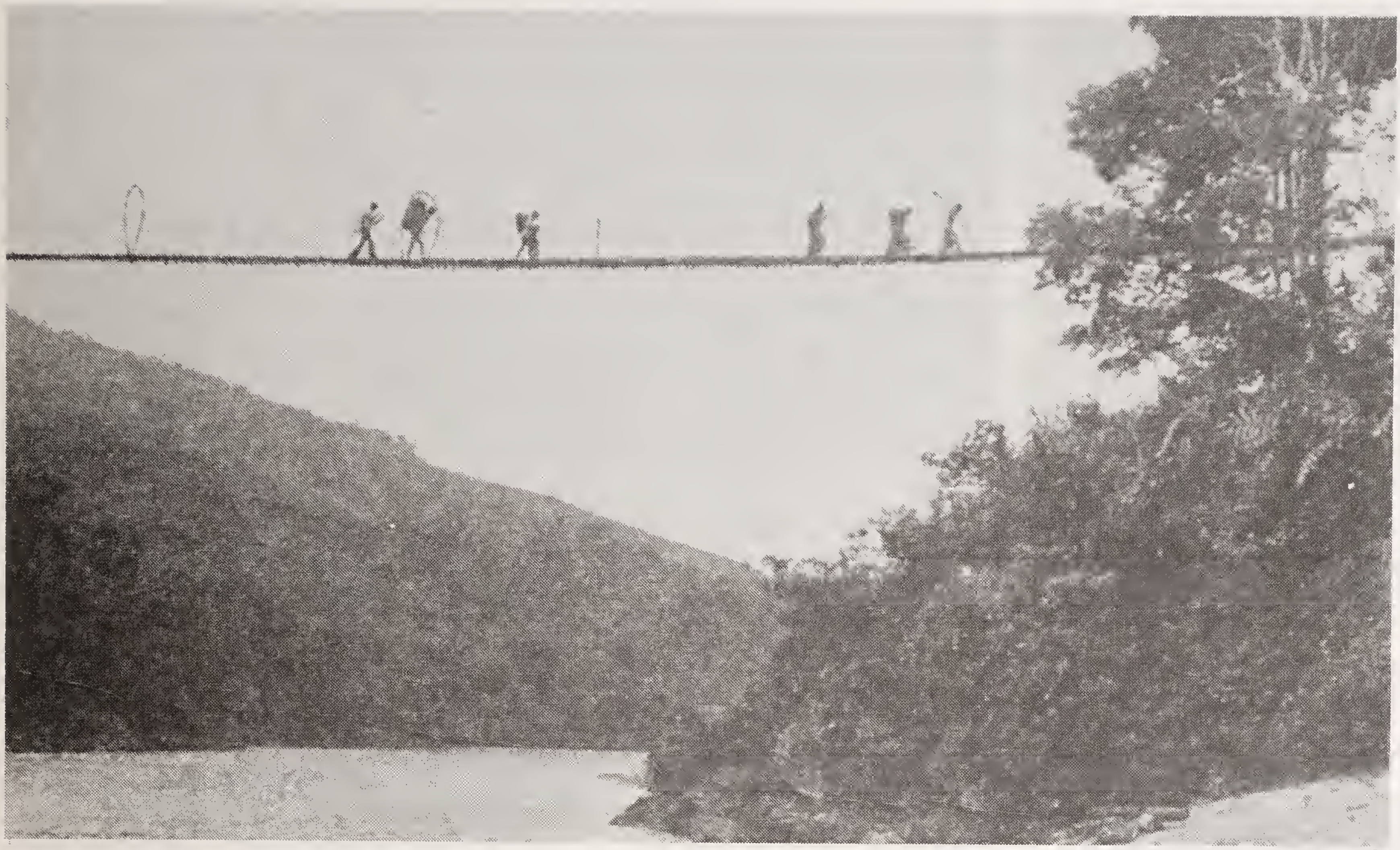

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linking villages across torrential mountain streams in remote parts of the northeastern region, especially in the districts of Arunachal Pradesh (fig. 53).

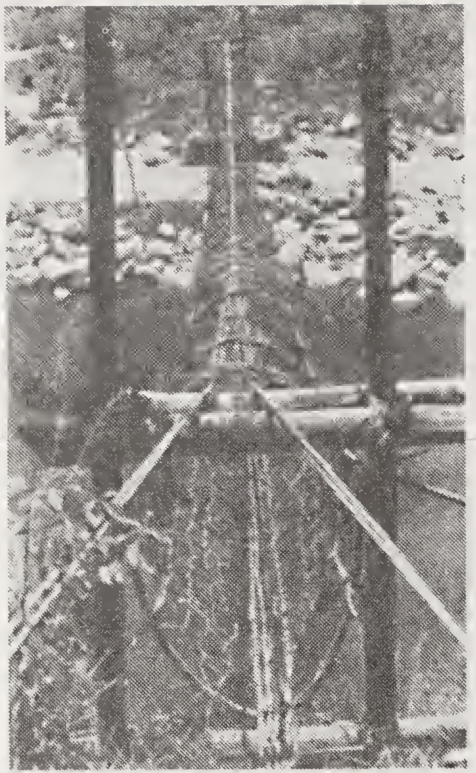
Traditionally these bridges are made entirely of locally available cane or bamboo or a combination of both. However, to provide a certain measure of permanence and safety, the government has been supplying steel cables free of cost to local inhabitants in order to replace the main cane suspension cables. One bridge seen had incorporated steel cables in its construction, but the essential character of the bridge was still retained despite this change.

Cane Suspension Bridge

The construction of cane suspension bridges may be considered a major engineering achievement. The site for the bridge is carefully selected, normally where the river narrows down between high banks so that the total length of the bridge is reasonably manageable. In spite of these considerations, Adi cane bridges, over 200 metres in length have been known (figs. 54-56). The availability of strong trees on both banks of the river, capable of supporting the main suspension cables, is another major consideration. Where suitable trees are not available for the purpose of anchoring the cables, wooden posts are held upright by a foundation of heavy stones piled up to form a pyramid around the post. This construction. is normally resorted to in several places in Western Kameng District near Bomdila where large trees are rarely seen (fig. 58)

Structure

The structure of the bridge is like a long open tube, consisting of a series of large cane hoops, made by twisting several whole cane lengths (fig. 57). These hoops are held between rows of suspension cables of cane, running from bank to bank, with the cables at the top of the hoops taking most of the load. Split cane, plain or twisted to form ropes, is used as a space-filling element on both sides of the hoops and a walkway made either of bamboo splits or whole cane lengths links the hoops at the bottom (figs. 59-61).



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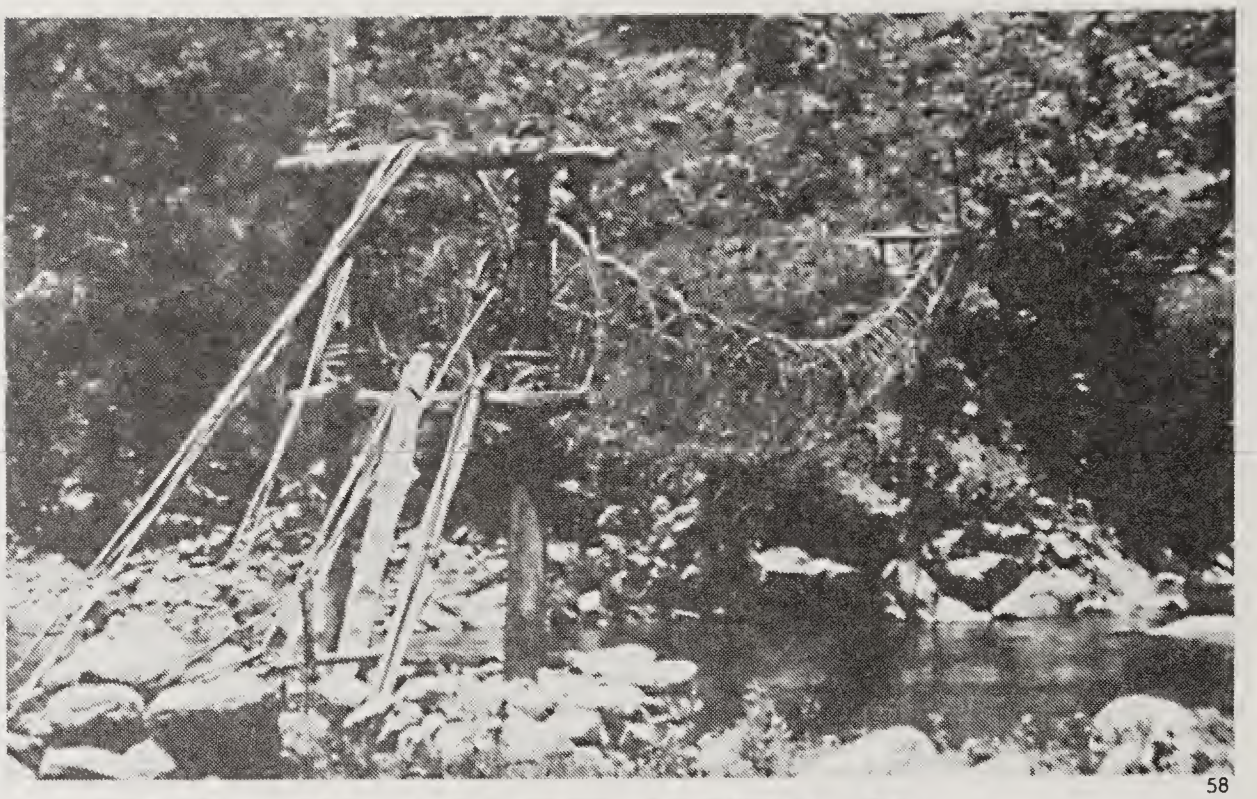

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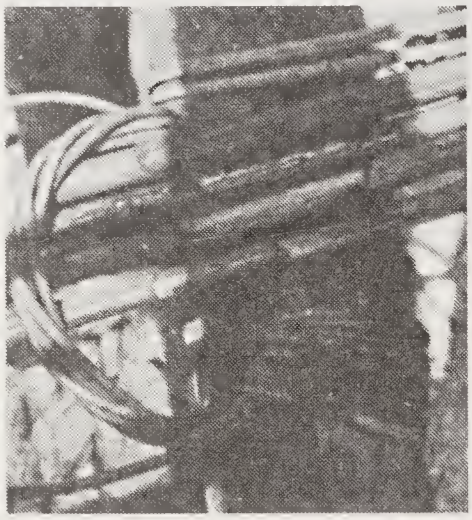

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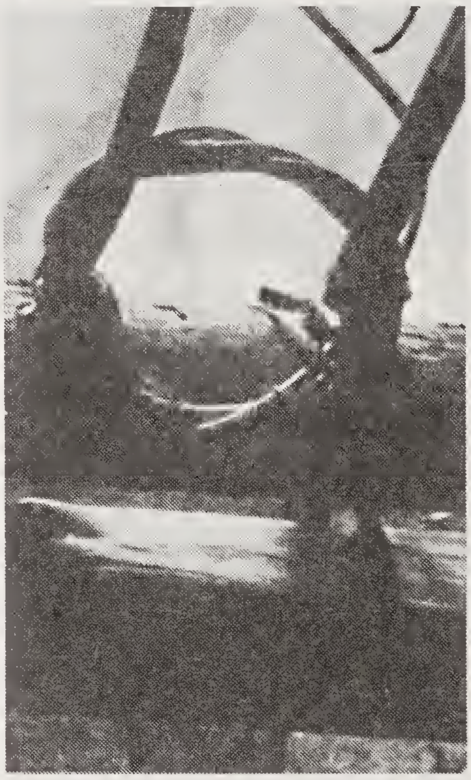

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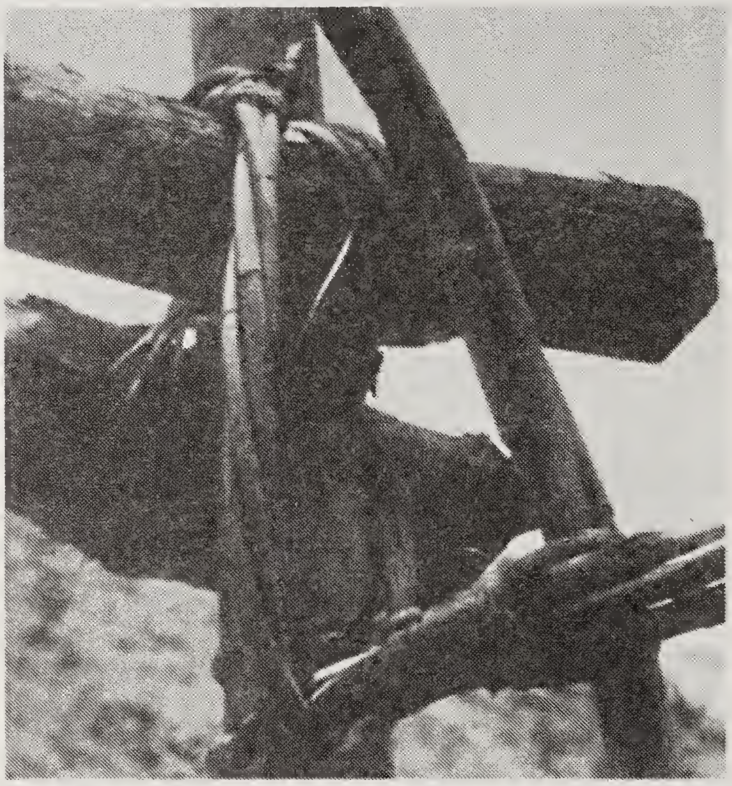

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57: An all-cane suspension bridge near Rupa.

58: The cane suspension bridge as seen from the opposite bank.

59: Binding detail of the suspension cables and the cane hoops.

60: Detail of the connection between the cables and the vertical wooden beam.

61: Detail of the connection between the cables and the horizontal wooden post.

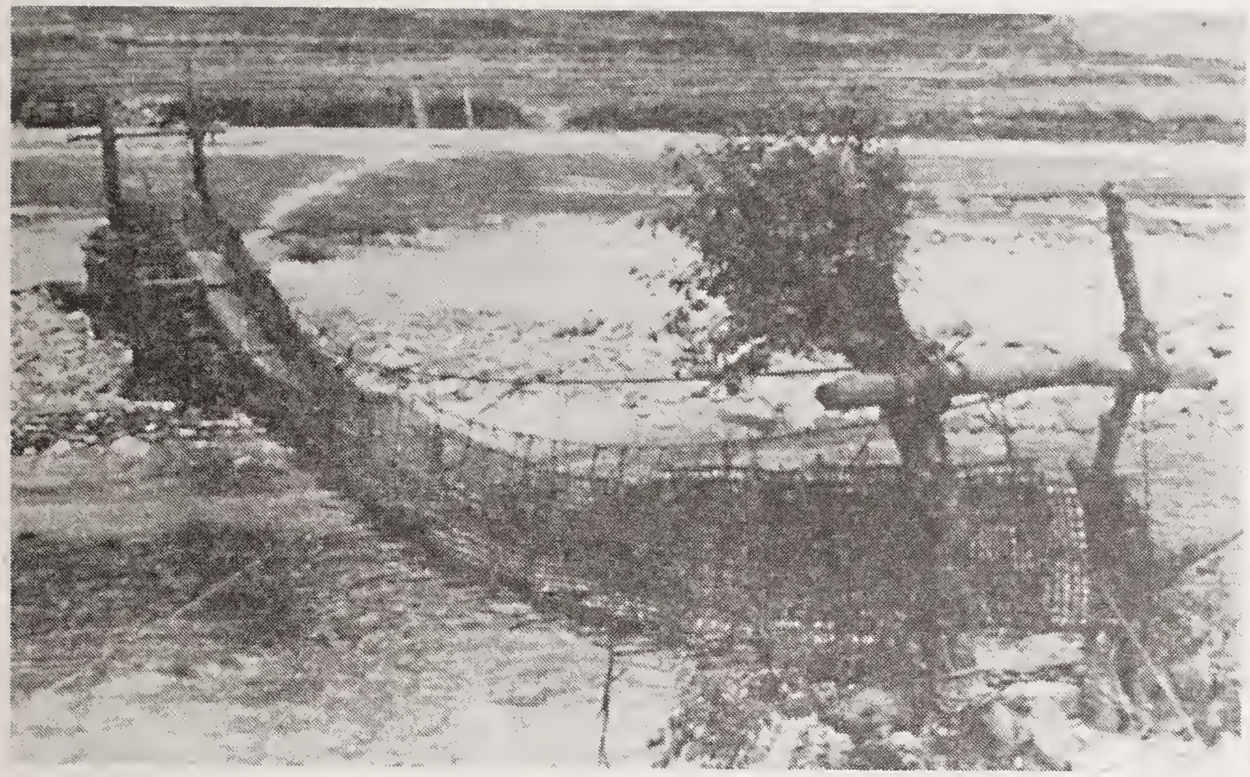
Walking along these bridges is an exhilarating experience as one easily learns to adjust one's movements to the rise and fall and sway of the walkway.

Bamboo Suspension Bridge

North of Bomdila, beyond the Himalayan foothills, cane is not easily available. However, the Monpas who live there are not deterred by this fact from building suspension bridges. They have developed their own way of using a locally available bamboo to construct these bridges (fig. 62). Building a bridge is a community activity and all members of a village contribute materials and participate in work camps to complete its construction.

Structure

Two such bamboo bridges were seen about 56 kilometres north of Bomdila, one completed and in use and the other in the process of being built (figs. 63, 64). Both these bridges were built by the Monpas of Lish village. In these bamboo bridges the suspension cables are made of bamboo splits twisted into a fibrous rope. A species of reed bamboo is used. The suspension cable is made up of several smaller diameter bamboo ropes twisted to make



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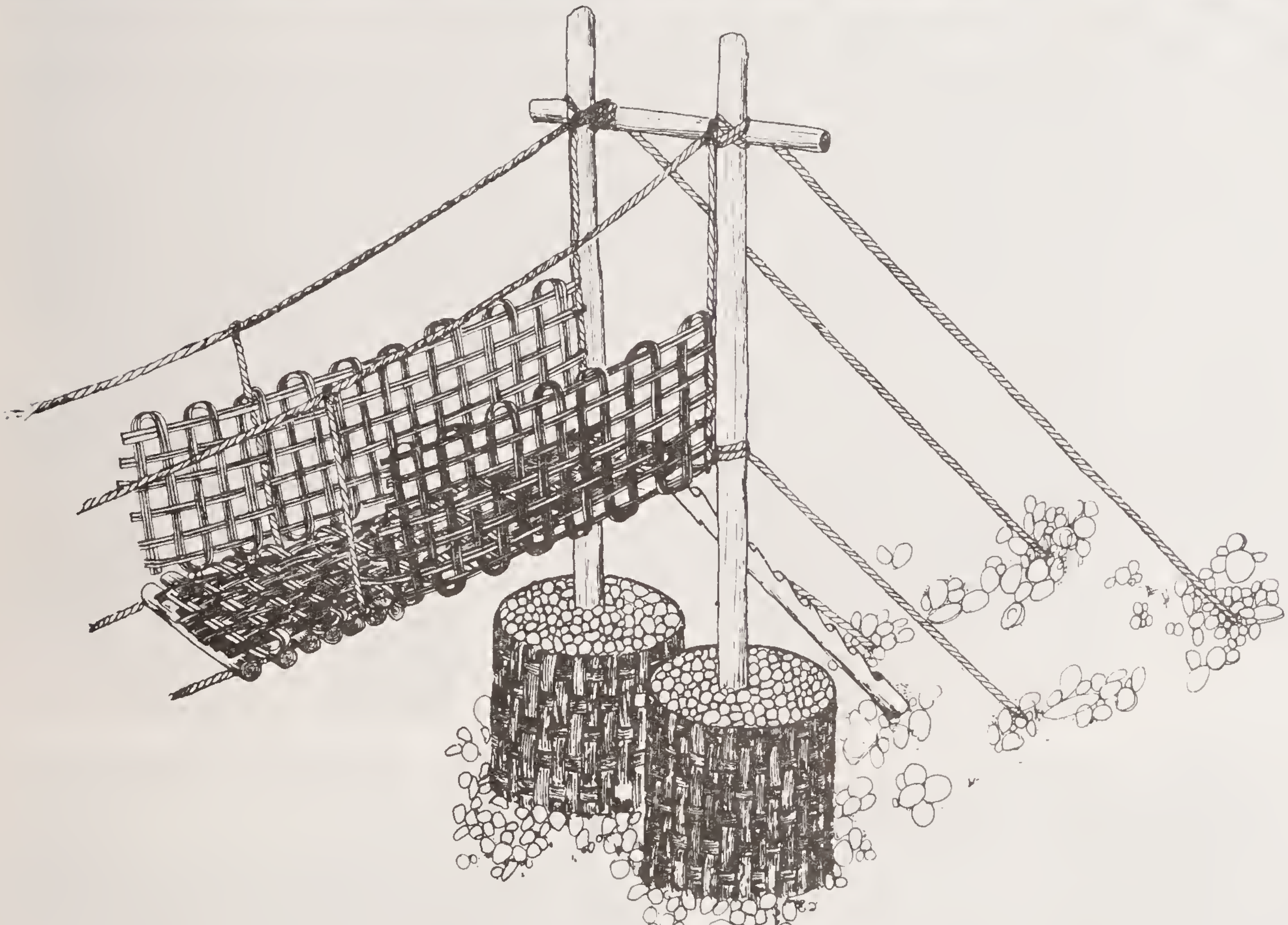

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a thicker rope. The length of bamboo being limited, several strands are overlappingly joined to finally make a strong rope about 60 metres long and of the required thickness of about 50 to 60 mm in diameter (figs. 65, 66). Six such ropes are suspended between large raised timber frames located on both sides of the river. These ropes are arranged one above the other in pairs with corresponding sets on either side of the bridge so as to form a U-shaped channel open at the top. The suspension cables are now cross-linked by additional ropes joining all the cables down one side, across the bottom and up the other side. The cross-linking is at regular intervals along the length of the bridge.

62: A bamboo suspension bridge near Dirang, built by the Monpas.

63: The south bank entrance to the bridge.

64: A cutaway view of the Monpa bamboo suspension bridge.

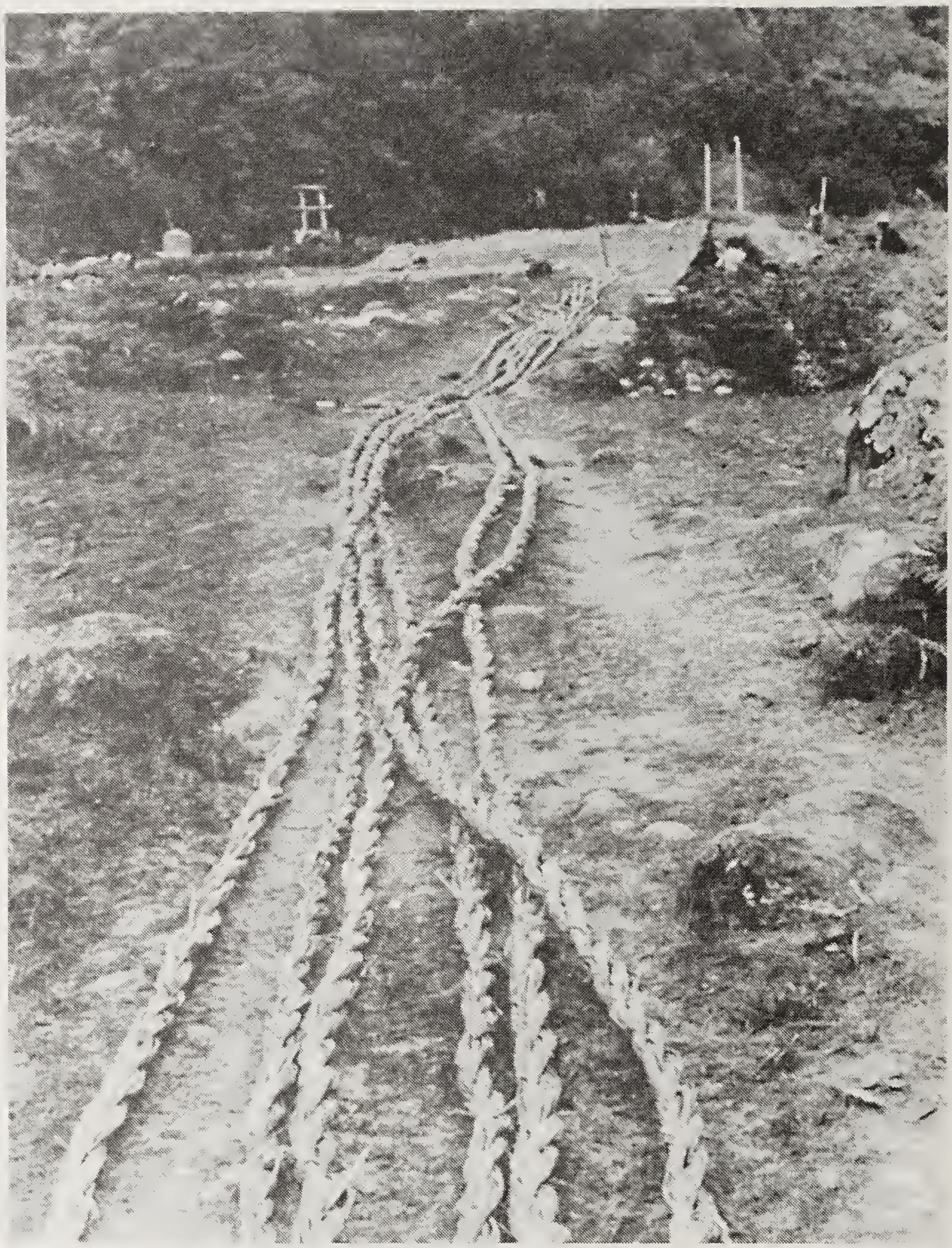
Walkway

Mats made of sheets of flattened bamboo culms are attached to the structure, forming the walkway, which is about one metre wide. Two more

65: Bamboo rope cables ready for erecting a new bridge. Note the length of the cables and the wooden supporting structure erected in the background.

66: Detail of bamboo rope.

67: Detail of side wall and floor of walkway. Note the wooden compression element used below the floor mat.



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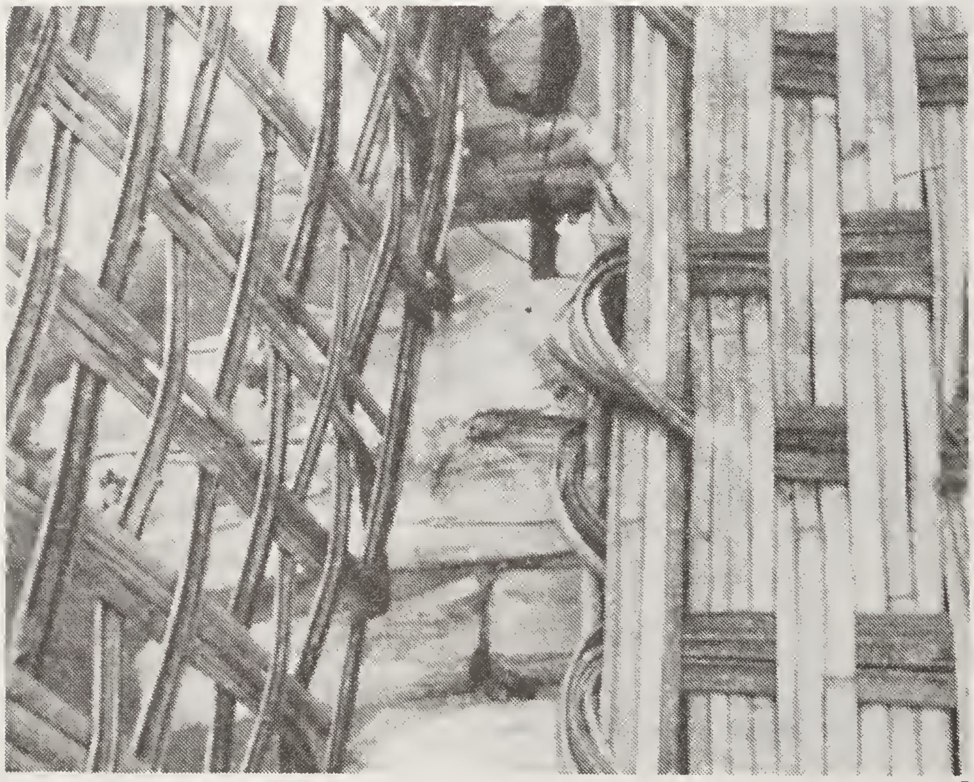

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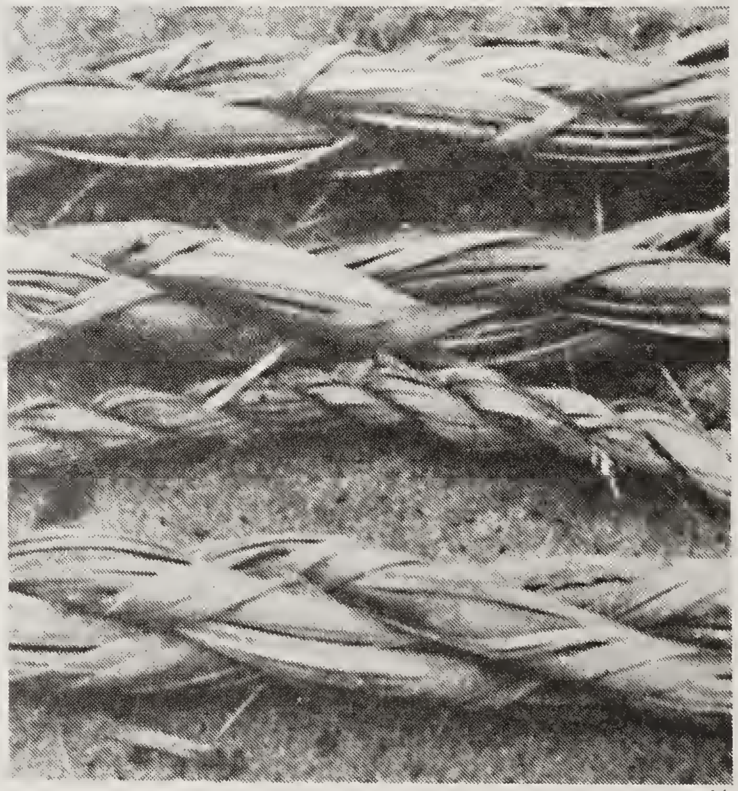

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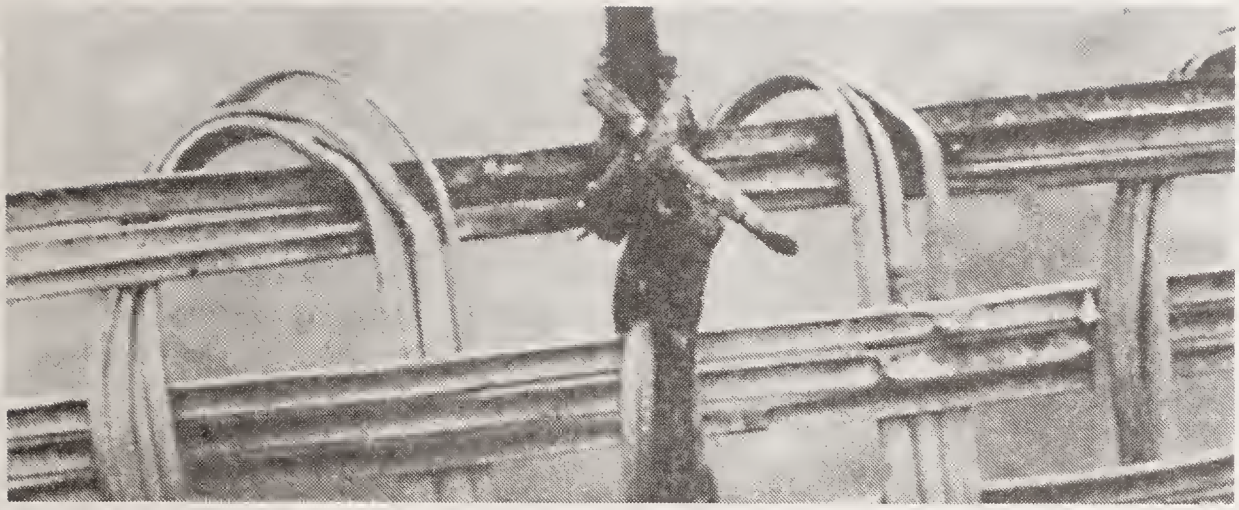

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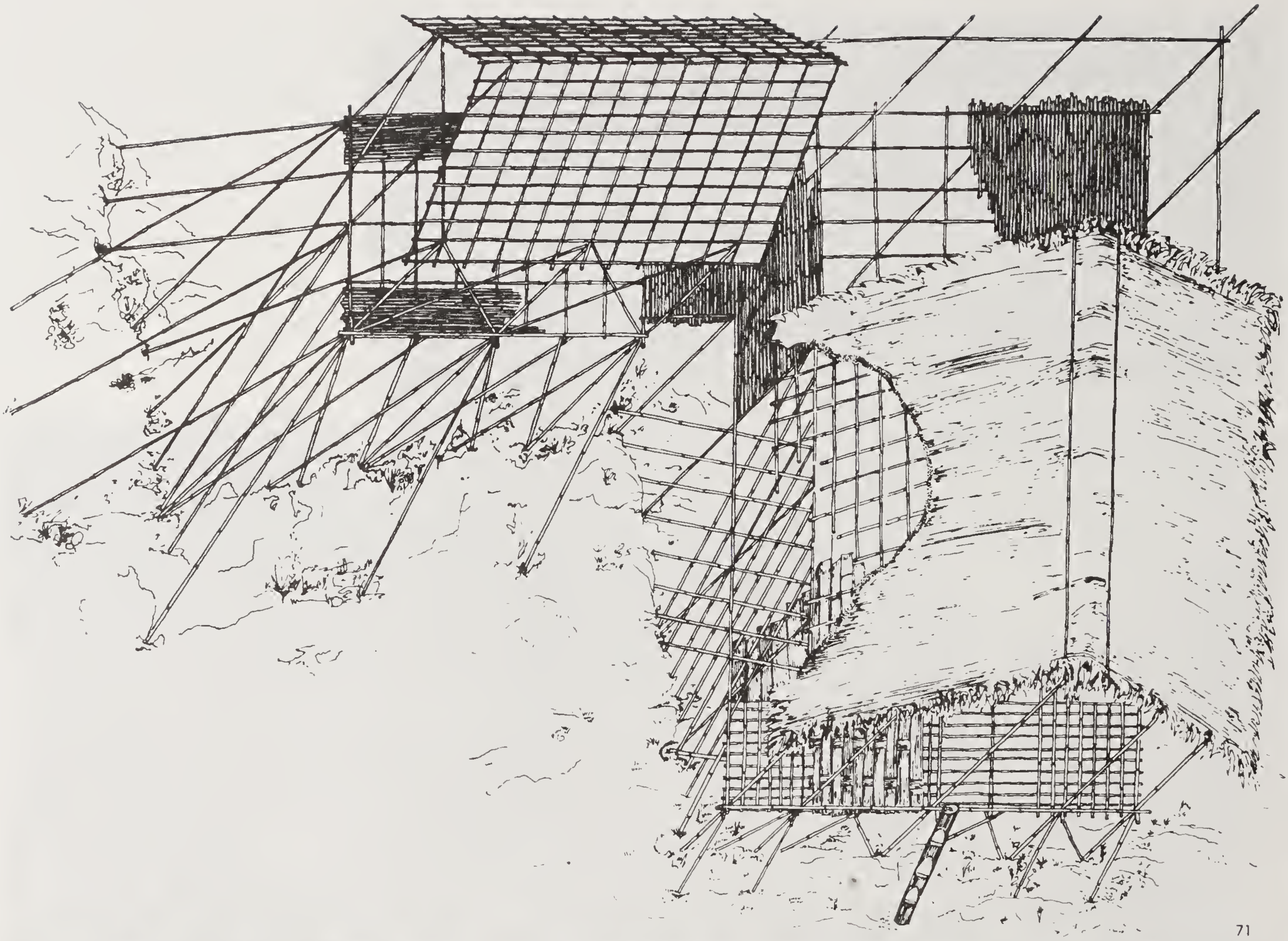
continuous mats of flattened bamboo are added vertically on both sides of the walkway and these are also attached to the suspension cables. At regular intervals timber compression members are fixed across the walkway to keep the suspension cables at that level apart from each other and to prevent them from collapsing into a V-shaped channel. The bamboo mats used for the walkway and side walls are woven in the characteristic Monpa way (figs. 67, 68). These mats are made using sheets of flattened reed bamboo in a structure analogous to woven textile. Rows of sheets along the length form the warp, running all through the length of the mat. Another sheet length is introduced to interlace alternate rows like the weft till it reaches the end of the mat width where it is bent to twist around the edge, to return, weaving across the face of the mat, gradually building up the woven surface. The mat used for the walkway has the warp elements closely packed together while the side walls have open space in its construction. These variations are governed by functional considerations, such as a uniform, strong surface to walk on; in the case of the side wall, the openings permit the passage of air, thus reducing wind loads on the structure.

Far more significant than the ingenuity of construction and the sensitive use of materials is the community involvement and participation in building the bridge. A tangible symbol of co-operative effort, this spirit should be fostered in all development efforts to promote the production of handicrafts (fig. 69).

68: Detail of side wall. Note the vertical cable on which the side wall is supported.

69: A group of Monpa craftsmen who have got together to build the bamboo bridge.



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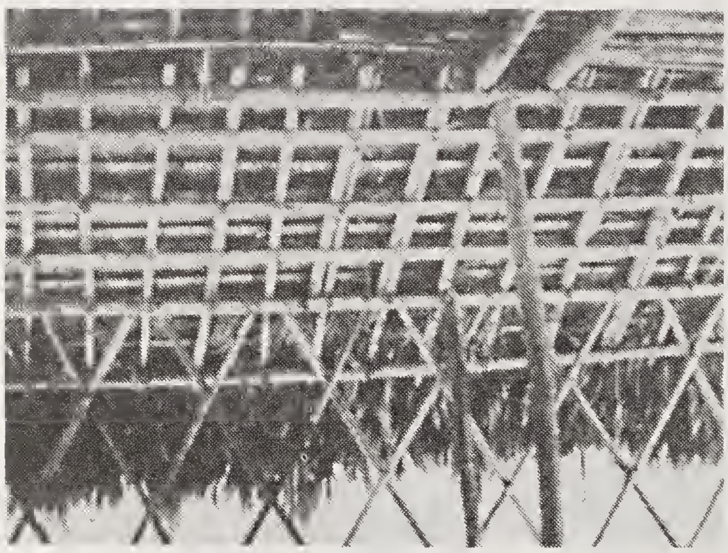

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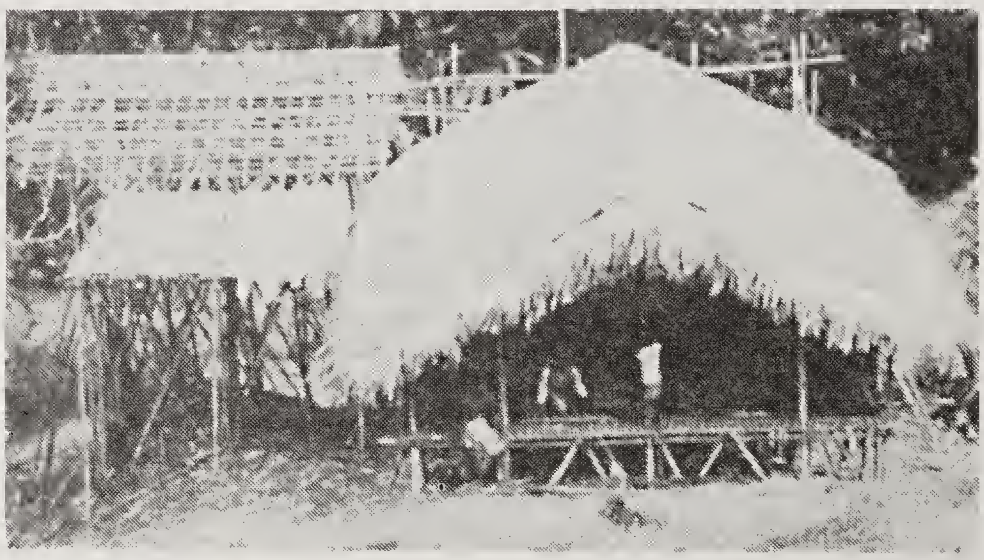

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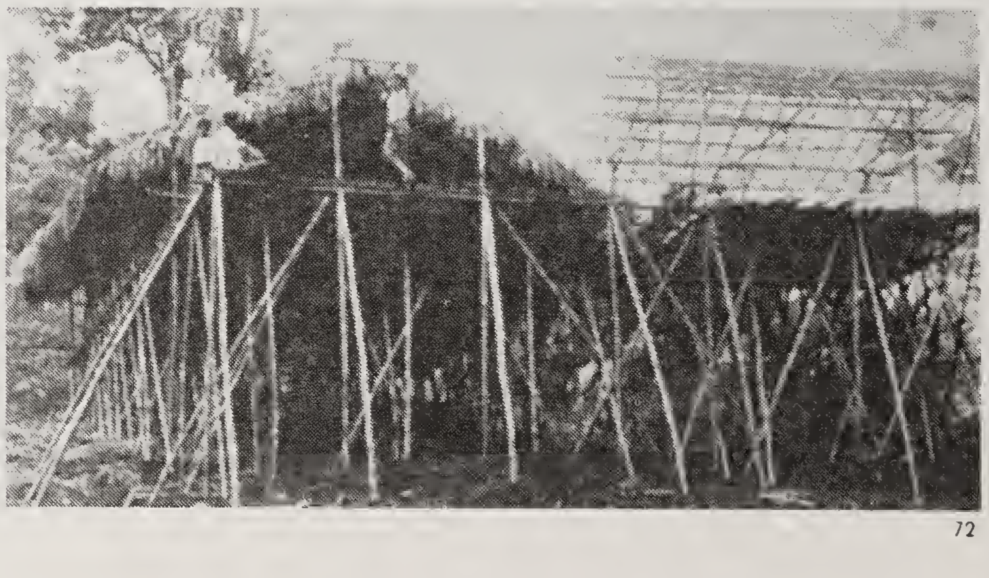
70: A Riang house under construction.

71: Axonometric view of a typical Riang hill dwelling.

72: Uphill view of the Riang house.

73: Detail of roof construction.



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Tribal Hill Houses

The Riang House

The Riang tribals of Tripura build their houses with bamboo used as the primary material for construction. In some cases, even the thatched roof is made of bamboo leaves. These houses are typical hill dwellings, constructed on bamboo stilts to create a large horizontal platform, the floor of the house. Bamboo posts are arranged on a square grid and these are strengthened by inclined whole bamboo members. A required number of posts extend above the surface of the floor platform to support the roof structure (figs. 70-72).

The plan of the Riang house is normally a long rectangle, with a covered verandah in front and an open verandah at the back. A large enclosed room is located between these verandahs. A single roof covers the front verandah and the room. The roof slopes downwards on either side of a raised central ridge running along the length of the house. The rafters are made of whole bamboo culms bent at the centre by crushing the culm where it rests on the central ridge and both ends move downward along the roof slope. Whole bamboo purlins are added before the thatch is laid out on the roof. All the members are bound by fibre ropes or bamboo splits (fig. 73).

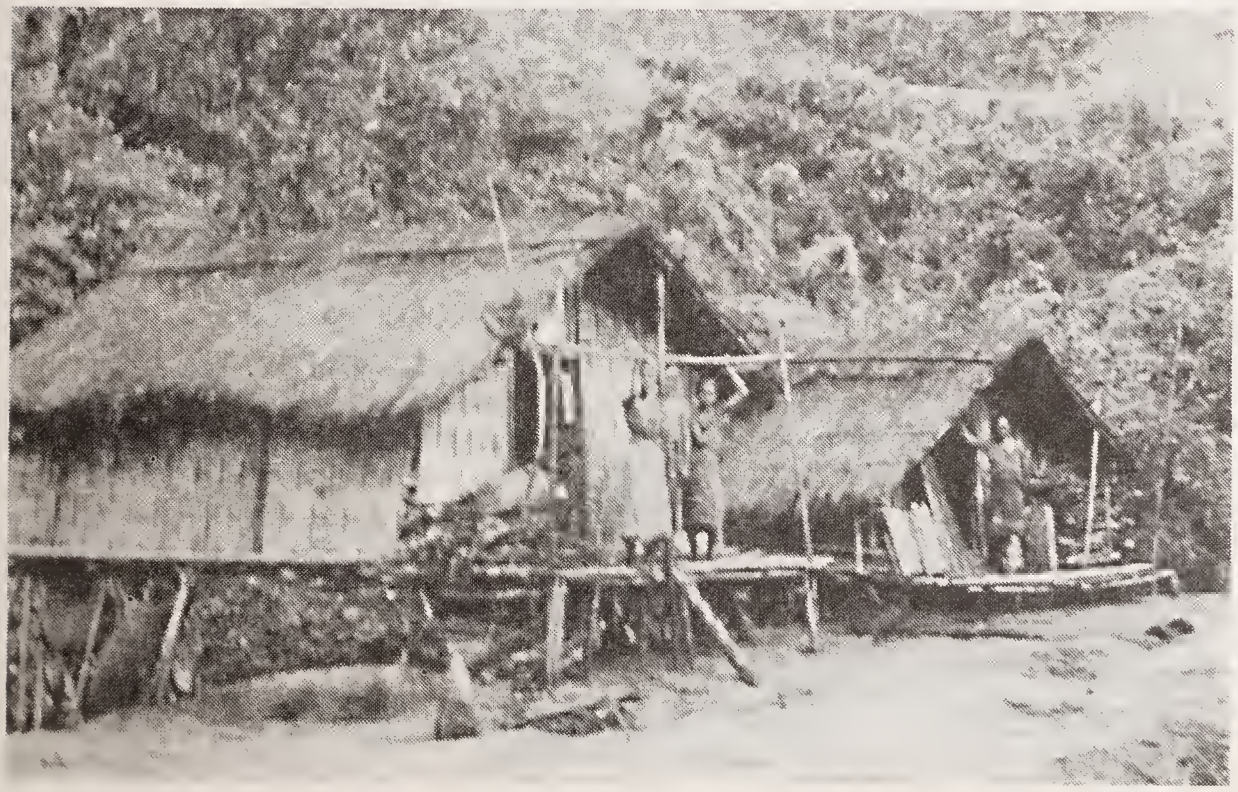
Boards made of flattened bamboo culms are used to cover the floor of the room and to make the walls and doors (fig. 74). The floor of both verandahs are made from either whole bamboo or longitudinal halves placed side by side and bound to the beam structure below the floor. A single log, which is notched, forms the short ladder at the front of the house.

In some cases a small outhouse is built adjacent to the open verandah at the back of the house. The structure of the outhouse is independent of the main structure. This is used as a kitchen, though the main room too has a fireplace. The open verandah is used for washing utensils and for craft activities such as loin-loom weaving and basketry. The open verandah at the back overlooks the hill slope and acts as a sun-deck which is used for drying vegetables and grains.

A large cluster of such houses, which forms a typical Riang village, is quite an impressive sight (fig. 75).

74: Detail of doorway. Note the sliding shutter.

75: Part of a Riang village.



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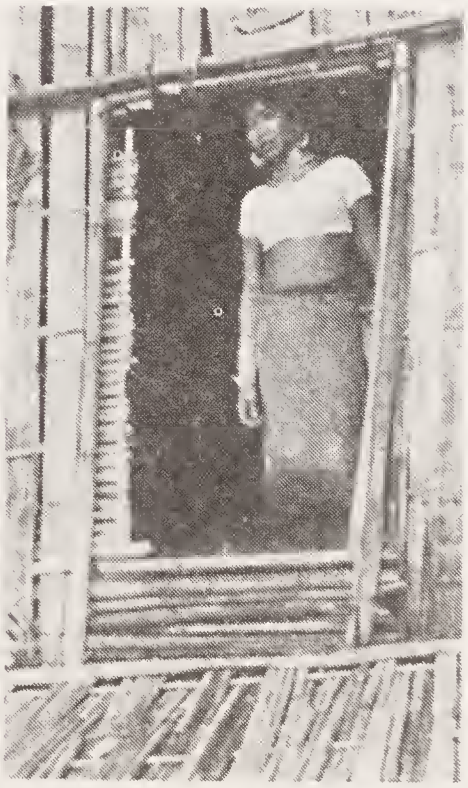

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76: Mizo houses at Thingsulthia.

77: Mizo houses along a highway at Chingchhip.

78: Plan and elevation of a Lushai bamboo house measured at Thingsulthia in Mizoram.

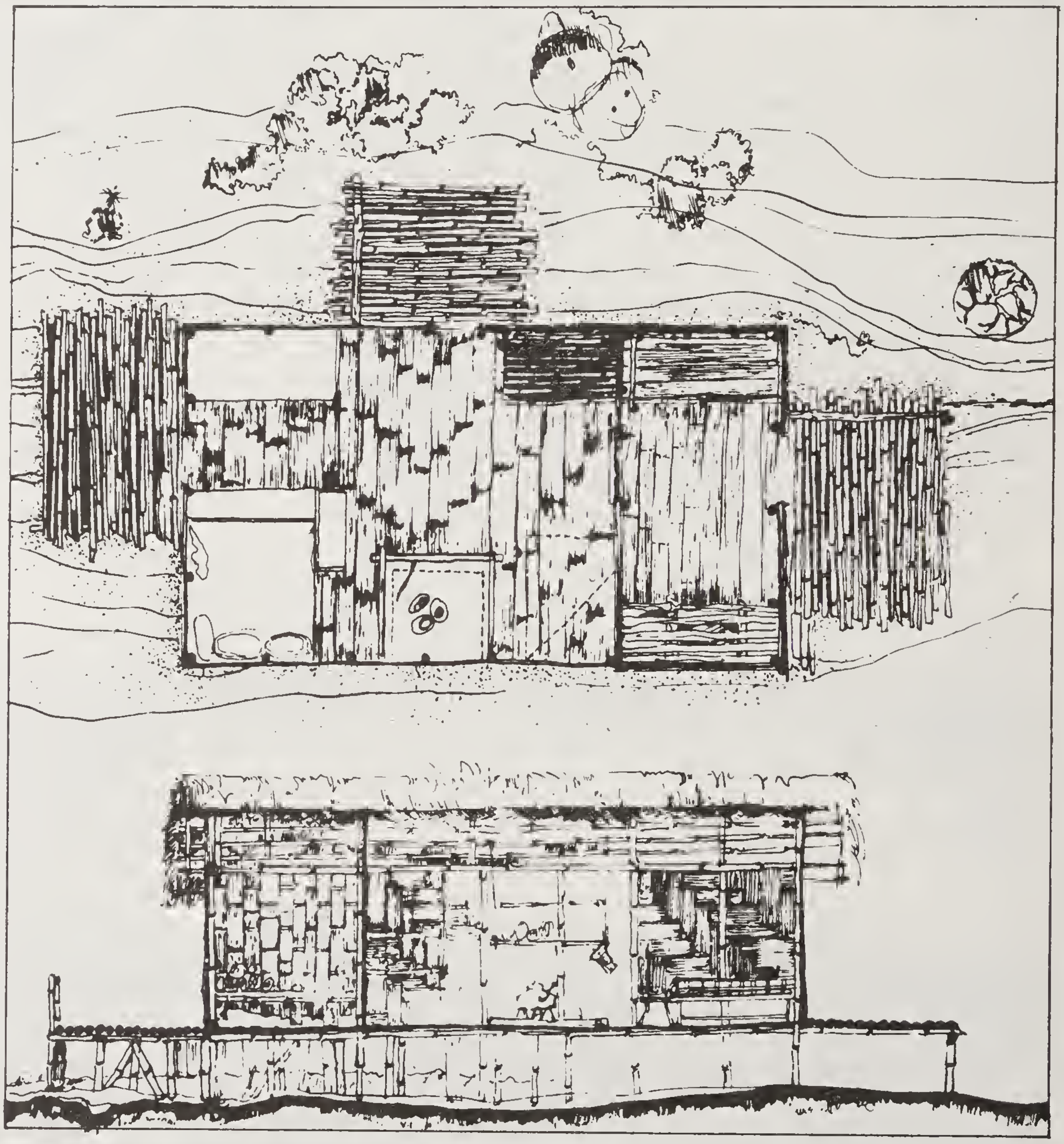
79: Walls woven from bamboo boards in a twill weave.

80: Walls woven with the boards moving diagonally as in plaiting.

81: The woven mat wall used for storage inside the house.

82: Bamboo boards and strong splints are woven into an economic structure.

83: The ingenious sliding window shutter of the Mizos.



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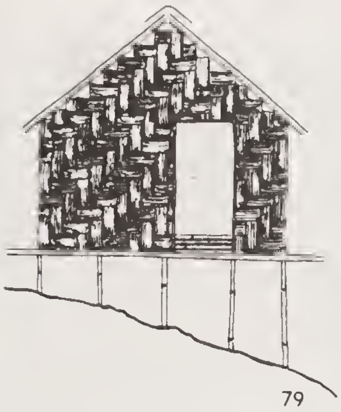

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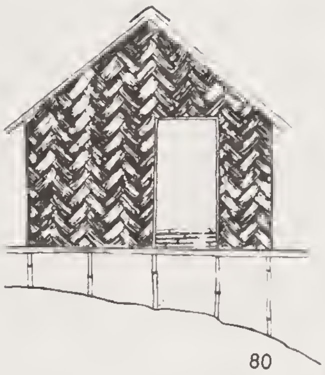

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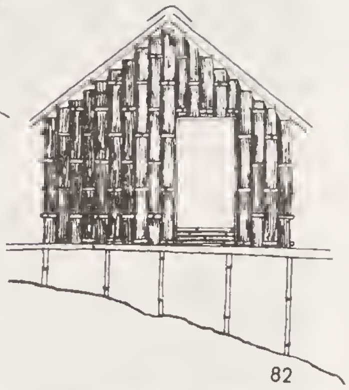

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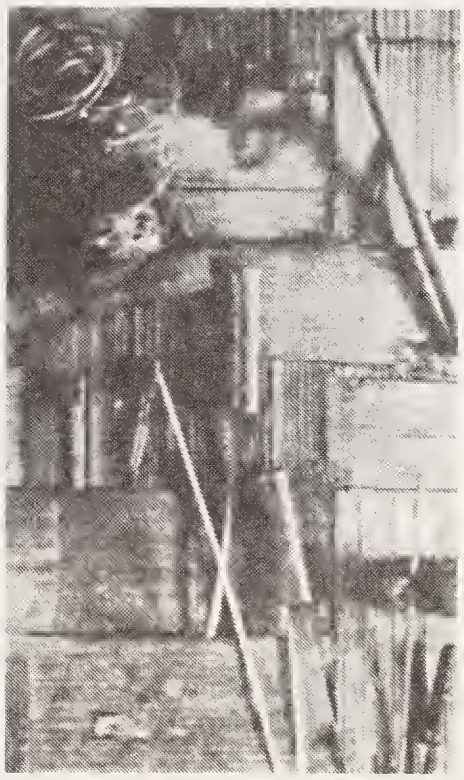
The Mizo House

The houses built by the Lushai tribe of Mizoram are similar in many respects to the Riang houses, perhaps due to the fact that they are neighbouring tribes. The predominant materials used in construction are bamboo and wood. In the small and medium-sized towns one sees the use of corrugated metal sheets for the roofs, though in the villages grass thatched roofs predominate (fig. 76).

All the houses hang in a precarious balance, hugging the steep hillsides. In the towns the houses and shops line the road as the hill drops away below (fig. 77). These houses are generally propped up by a cube-lattice structure of posts and beams (fig. 78). Looking up towards the hill one sees the floors of the houses above made either of wooden planks or bamboo lengths halved and lashed together.

Walls

Basically, three types of weave structure are used for the bamboo mat walls of these houses. All three use mechanically flattened whole culms in the form of boards. Two of these use the flattened bamboo boards in the vertical and horizontal, but the weave structures vary between plain and twill, the latter creating a strong diagonal pattern (figs. 79-81). This super-graphic effect is accentuated by selectively exposing the inner or outer layers of the bamboo boards, as weathering affects these surfaces differentially. The third weave structure uses these flattened boards in the vertical, while the horizontal is made up of thick but narrow splits of bamboo, spaced well apart and alternately interlacing the vertical boards (fig. 82).



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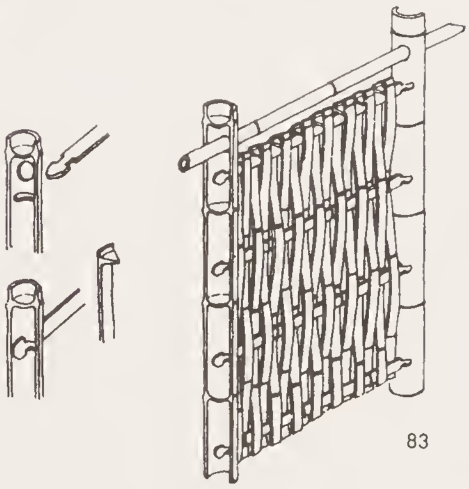
Mizo Window

The construction of the Mizo (Lushai) bamboo doors and windows demand attention. These are of two basic types: those that slide across the opening behind or those that swing up around a pivot or ring located at the top of the opening. These shutters are rectangular planes where the two vertical edges are made of either whole or halved bamboo members. Along the length of these members, horizontal, elliptical holes are spaced uniformly on the inner surface of the vertical culms. Through these holes, the ends of strong bamboo splits are introduced and as these splits have their ends shaped like a hammer head they can be rotated around their axis so as to lock themselves into these elliptical holes (fig. 83). Finer splits are now interwoven through a series of locked splits which provide the tension to anchor the whole assembly into a homogenous unit.

The significance of this construction lies in the creation of a rigid structure without any form of binding, which is the method normally used in bamboo structures.



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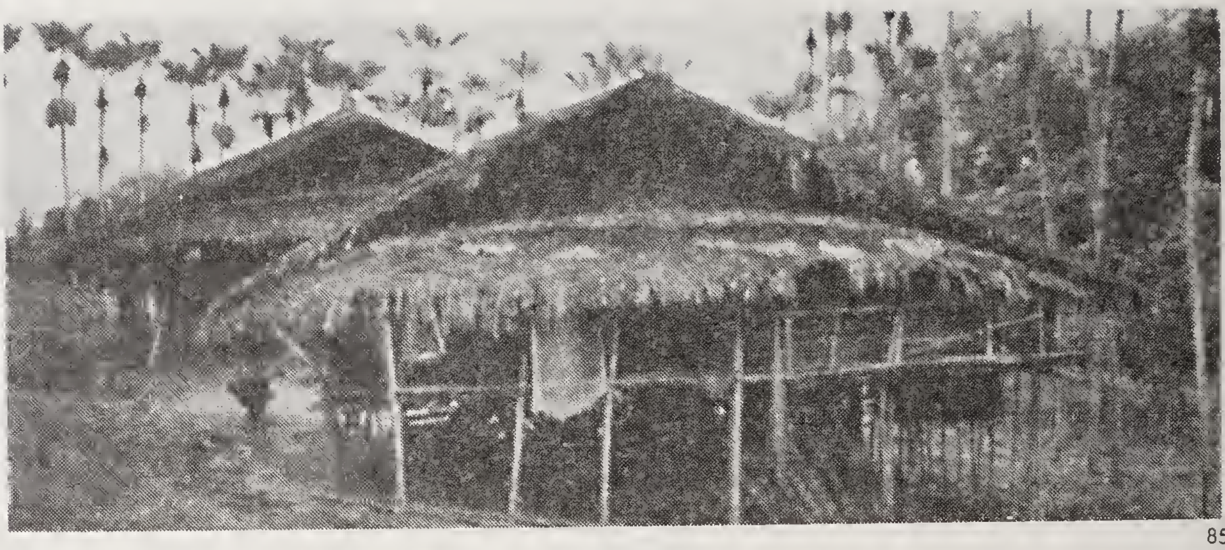

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The Adi Gallong House

The Adi Gallongs live in the hills around the district headquarters of the Siang District in Arunachal Pradesh. Their villages are generally located on hill-tops spreading some way down the hill slope and the site is selected keeping in mind easy access to water and the availability of suitable land for cultivation nearby (fig. 84). The first inhabitants of the village occupy vantage locations near the top of the hill and the subsequent growth continues down the slope. The access to the village is normally a narrow footpath leading over hills and fields, linking one village to another or to its water source. Nowadays several of these villages are linked by "Jeepable" roads.

Materials and Spaces

The individual houses (fig. 85) and granaries (fig. 86) are built of bamboo and wooden planks lashed together in a specific configuration and covered with a thatched roof. These houses are built on stilts made of bamboo and wooden planks tied together with cane splits, to create a horizontal platform. In the granaries, a large wooden disc resting on the post prevents rats from climbing on to the horizontal platform (fig. 87). The fronts of all the houses in the village stand facing the top of the hill. A pigsty latrine is recessed into the floor at the back of the house ensuring natural drainage of effluents down the hill slope. The solid wastes are consumed by pigs kept in the space below the floor.

The house itself consists of a large central living core which is surrounded by a semi-open verandah running all round this core (figs. 88-91). The width of this verandah varies at places to satisfy specific functional requirements. A portion of the platform is cut away in the front to provide space for a short ladder affording access to the platform. This area too is covered by the roof. The ladder (*coba*) is made of horizontal struts of whole bamboo about 0.5 to 0.65 metres long hung between two lines of cane rope attached to the platform. This assembly rests on two wooden beams inclined against the platform, ensuring that the ladder is kept at a convenient angle for climbing and preventing it from swinging.

Verandah

In a house examined in Tabasara village the central living core was a large square. To the left of this core, when seen from the front of the house, the verandah platform was almost one metre wide and was used to store firewood, essential for the functioning of the house. At the back, the verandah was 1 to 1.3 metres wide, allowing space for washing and the pigsty latrine. To the right of the living core the verandah, about three metres wide, had a fireplace, around which the family and occasional guests gathered. It was also a general workspace used by the women to weave on their loin looms and by the men to work on baskets of cane and bamboo. This space was also used for general household functions though the cooking was done in the fireplace inside the central core.

84

84: A view of Tabasara, an Adi Gallong village.

85: Adi Gallong houses at Darkang village.

86: A granary at Darkang village.

87: Detail of the granary post.

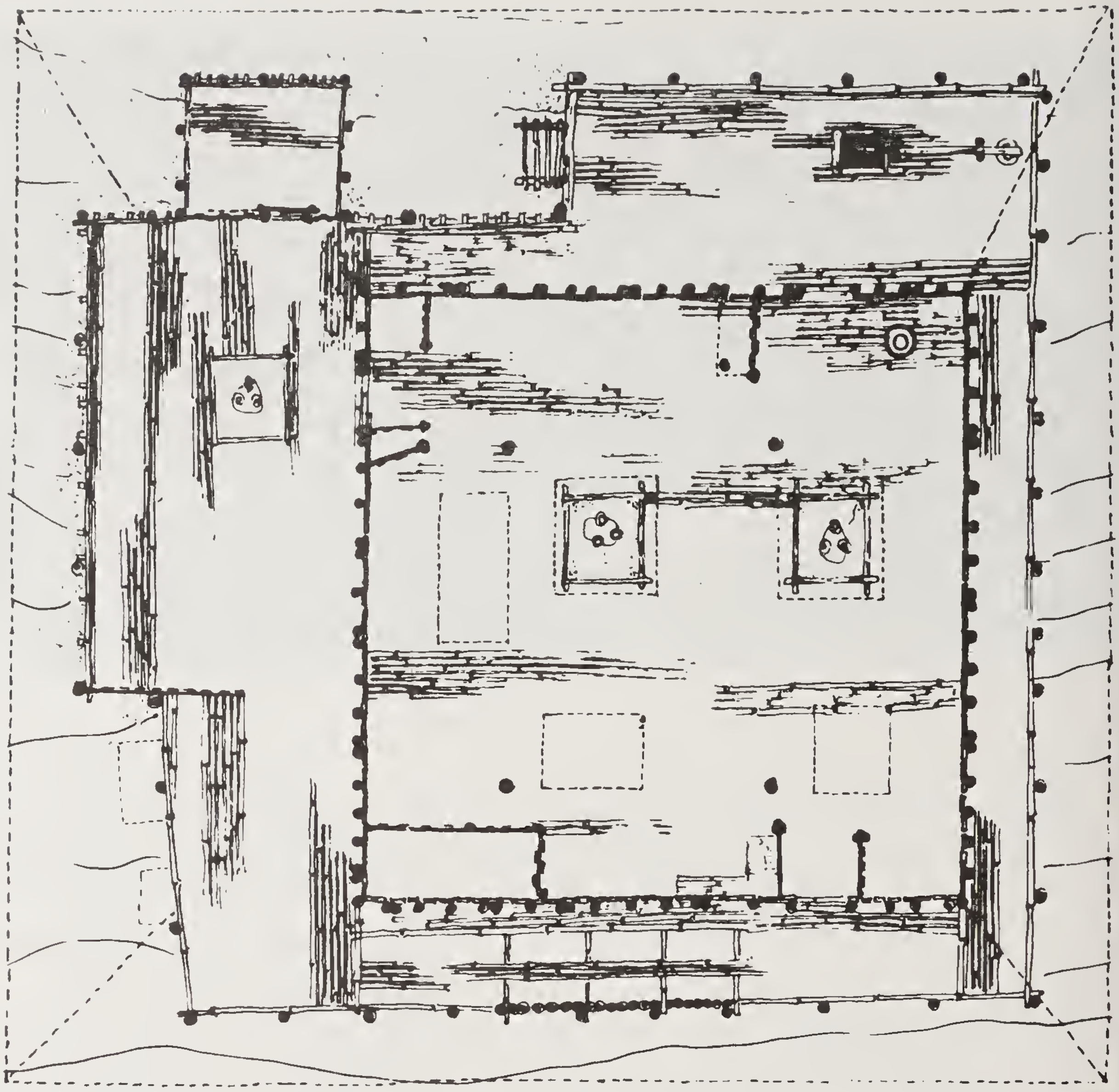
Living Space

The central core (*namra*) was a large square, 7.5 metres wide. This area is always pitch dark as there is no opening for light to enter except for the three small doorways, one leading directly to the front entrance verandah, the second to the large verandah and the third to the latrine and washing place. The first door is used by women and the second by men. The fireplace is a prominent feature of the dark living space as it provides the necessary light and heat and this remains lit almost continuously. As a result the interior of the house gradually turns a deep black with the deposition of soot. The smoking has a preservative effect on the materials used in construction and as a result are generally not affected by rot and fungus in spite of the wet conditions that prevail during long spells of the monsoon.

There is the inevitable hanging shelf suspended above the fireplace. Firewood for immediate consumption is stored on the lowest shelf and above this are stored meat and grains to be dried and seasoned. The uppermost shelf is generally reserved for cane and bamboo baskets which are stored here when not in use. These baskets benefit from the preservative smoking which also imparts to the material a rich red-brown to black colour, the parts of the baskets that are most handled acquiring a lustre. Raw meat is stored behind a small partition of woven bamboo splits in one corner of this room. In the opposite corner, at the back of the room, there is a small rectangular space (*aakangri*) for keeping valuables. The entrance to this room is carefully concealed and kept secret. Just outside this, a mat (*nyode*) is spread on the floor for an elderly person in the family to sleep on. Another corner of the central space is used for preparation of rice beer, an essential item in any Adi Gallong home. A single pitched roof covers the central living core and extends slightly beyond the surrounding verandahs. The roof hangs low over the edge of the verandah.

Flooring

The flooring inside the central core, the large verandah and the entrance verandah is covered with bamboo matting prepared by weaving flattened bamboo boards. The weave used gives a uniform smoothness because the outer part of the culm is used as the floor surface. The floor becomes smoother with use and is comfortable to sit and sleep on. The floor of the verandah used to store firewood is woven in a coarse texture and the one for washing is made up of halved bamboo culms placed side by side with the split surface facing the ground. These are spaced sufficiently apart to permit any water to drain out easily through the floor without hampering movement over this area. The halved culms are lashed down to the structural elements using split-cane binding.



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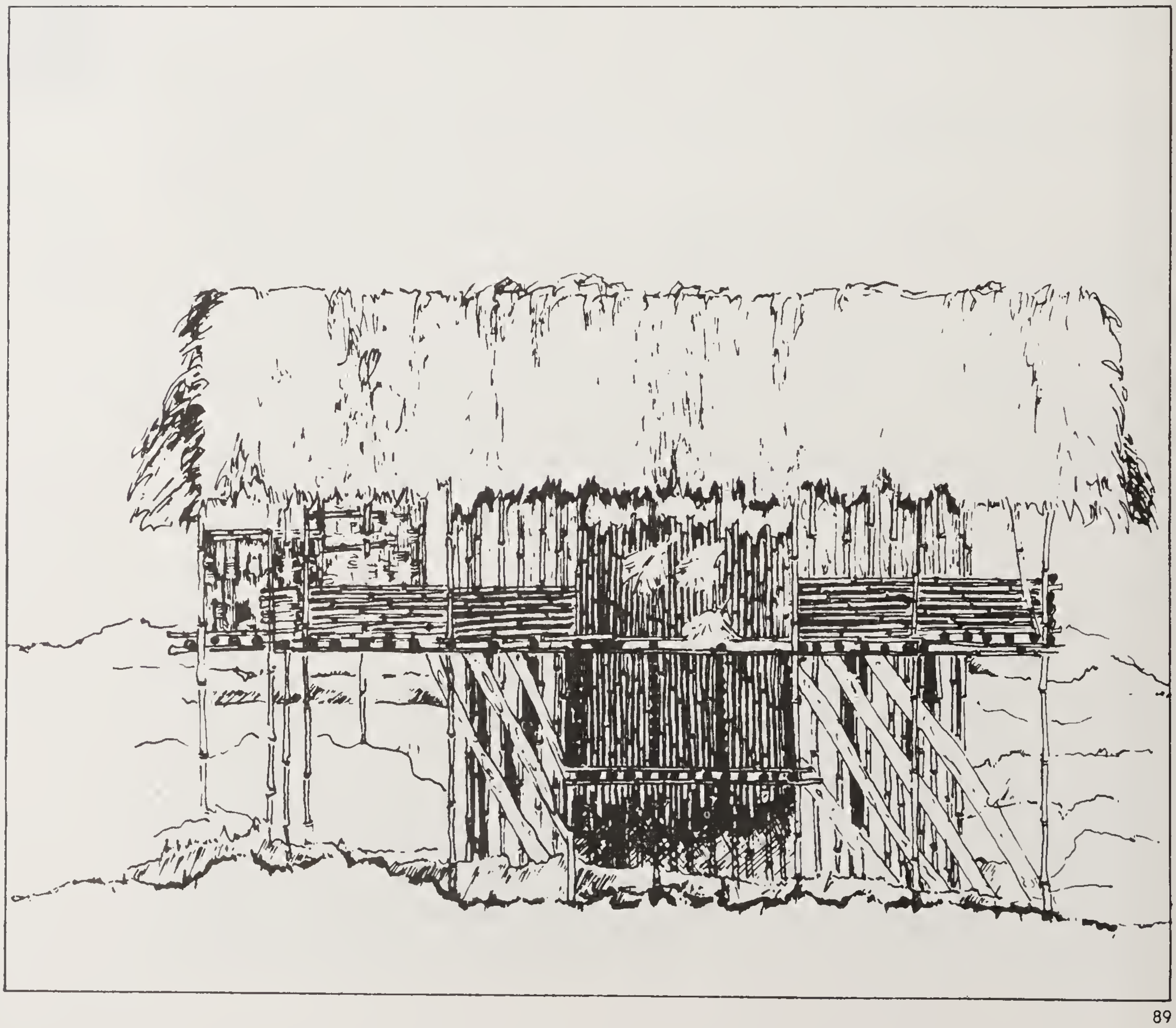

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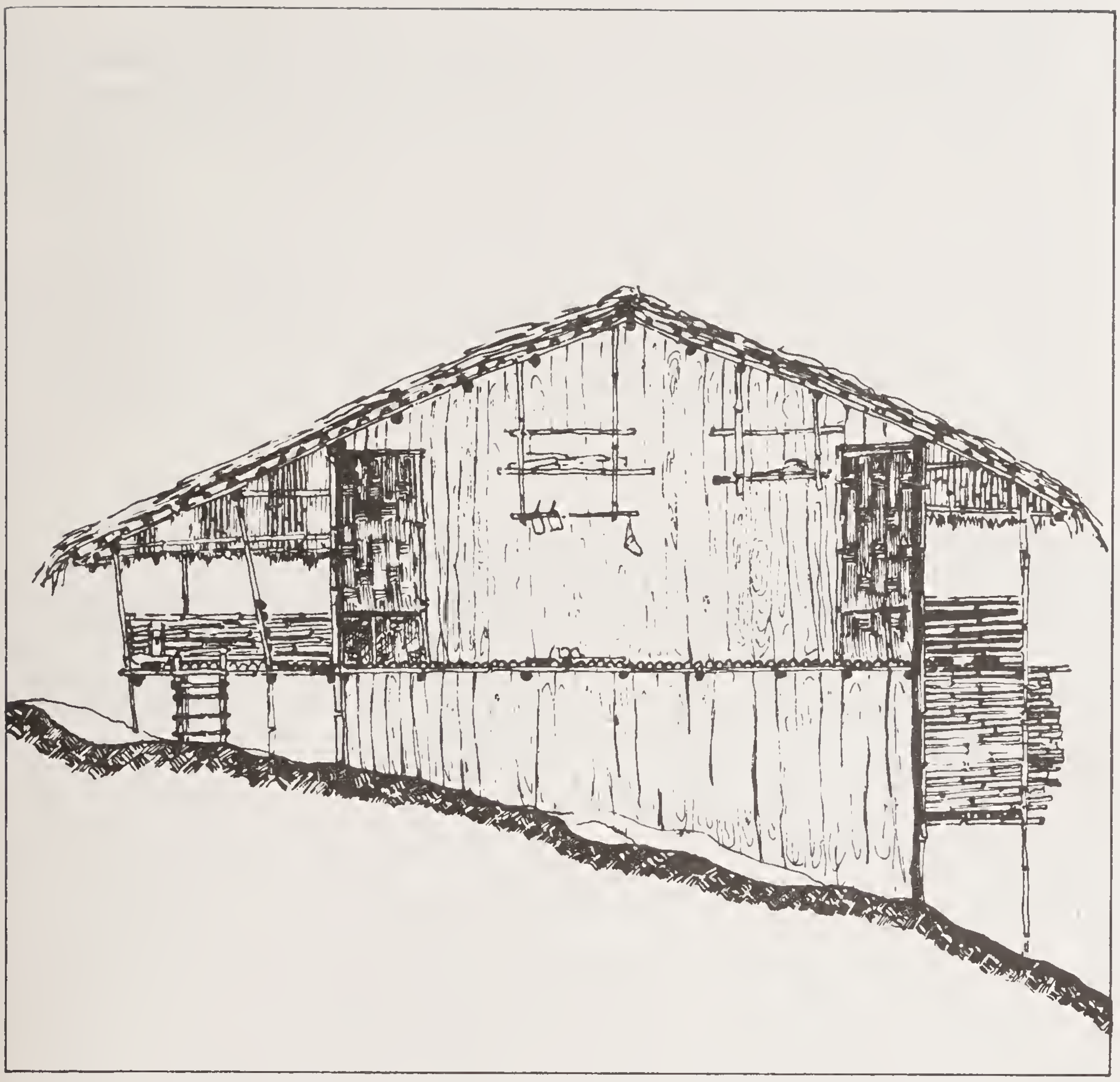

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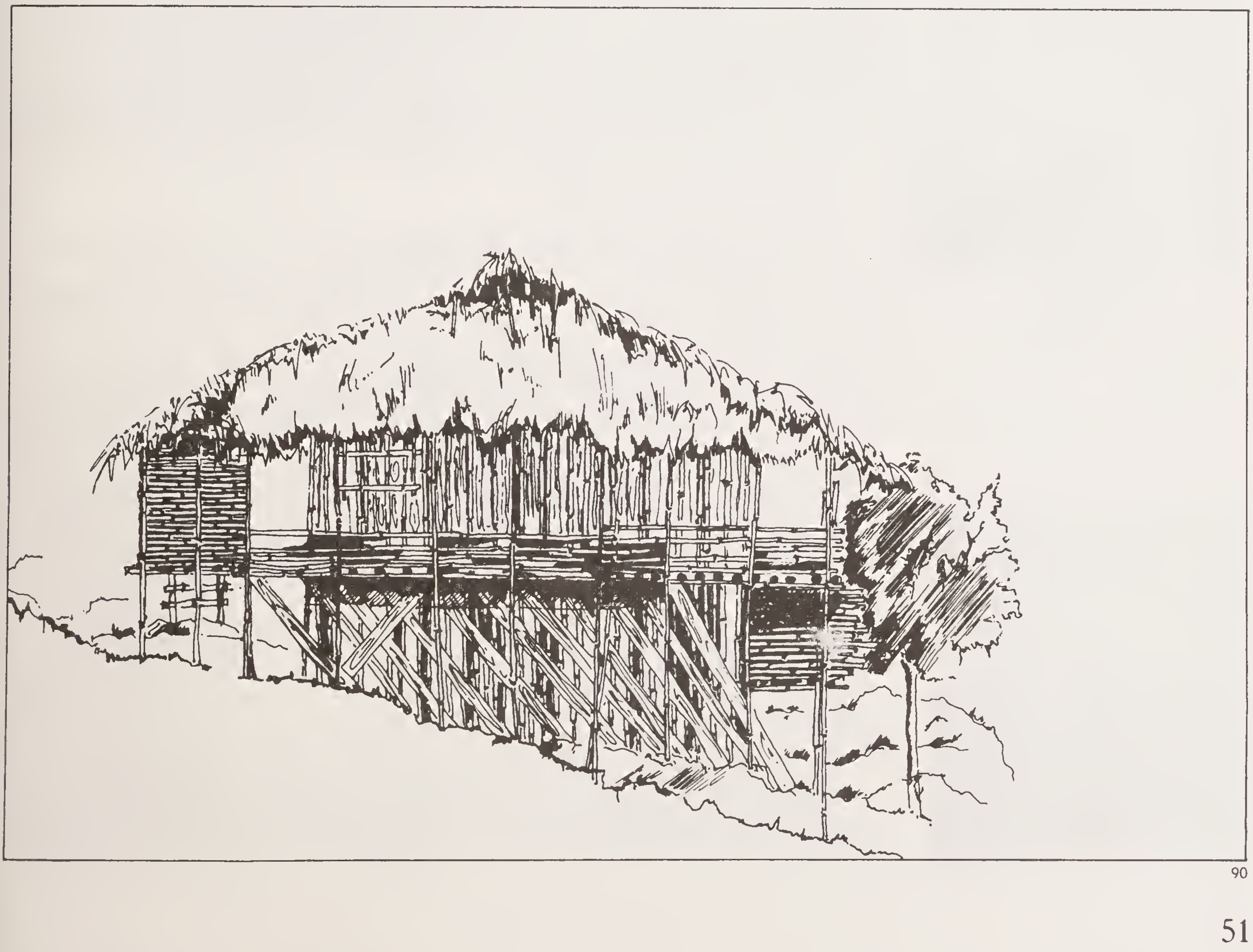
88: Plan of an Adi Gallong house.

89: Elevation of the house. The structure in the middle of the house is the pigsty latrine.

90: Side elevation of the house.

91: A sectional view through the entrance verandah and pigsty latrine.



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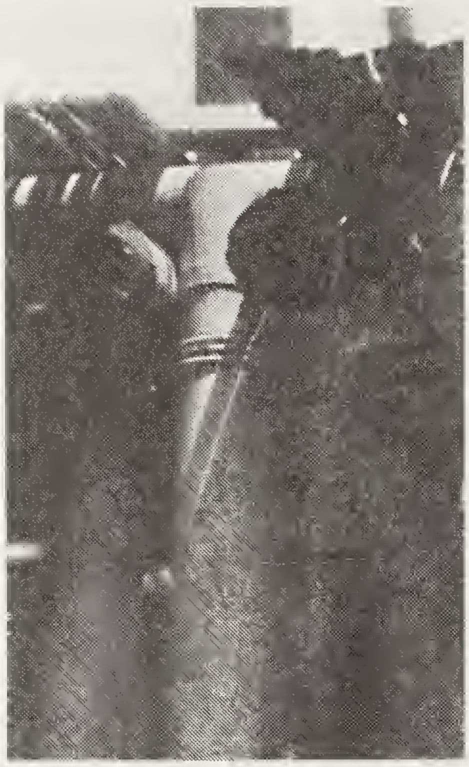

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92: A detail of construction of the post, beam and floor boards.

93: Detail of the wall around the pigsty latrine.

Structure

The platform of the house rests on bamboo posts of different lengths to accommodate the hill slope. The tops of these posts are at one horizontal level. These posts are spaced apart and arranged in rows to form a square grid in plan. Rows of whole bamboo beams are arranged in one direction and these rest on the posts. On top of this row of beams is placed another set of bamboo whole culms smaller in diameter and closer spaced than the main beams. These sub-beams run across the structure at right angles to the main beams. On top of these is yet another layer made up of halved bamboo lengths running parallel to the main beams and spaced much closer together. The whole assembly is lashed together with cane splits. Bamboo matting is then laid out over the structure to create the floor of the house (fig. 92).

Selected bamboo posts extend above the floor level to support the roof structure. Posts around the periphery of the verandah also act as supports for the side railing of bamboo and those around the perimeter of the central core support the wall structure. There are four large posts located inside the living core, which support the roof.

The main roof beams run across the length of the house forming a ridge down the middle. The roof slopes down on both sides towards the front and back of the house. Whole bamboo rafters placed on top of the main roof beams support bamboo purlins running parallel to the main beams which in turn receive the palm leaf or grass roofing material. Small additional roof slopes are added under the main roof to protect and cover the verandahs on both sides of the house.

Below the platform, wooden planks are used to strengthen the bamboo posts. These are placed so that they support the bamboo posts directly below the periphery of the central core. These planks are set at an incline, and provide the diagonal braces necessary to make the whole structure rigid. This arrangement gives the house its characteristic appearance. The walls of the central core are made of wooden planks lashed to the bamboo structure. Inside the living core, small partitions are made of mats woven from bamboo splits. These mats are held within rectangular frame structures made of halved bamboo lengths, several of these lengths being lashed together and to the mat with cane splits. These panels are then fixed to the structural members available for support.

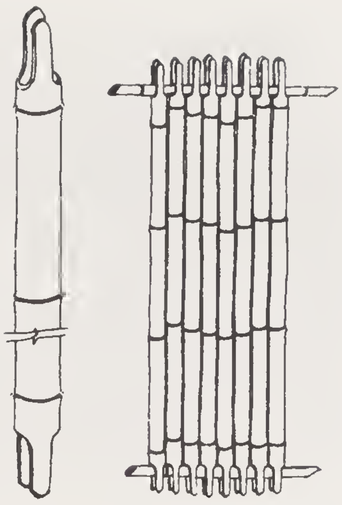
Doors

The door shutters are similarly constructed using mat and lengths of halved bamboo culms. These are placed in position for use either as hinged shutters or sliding shutters over the opening in the wall which is the doorway. No metal is used in the construction and the hinging is done by tying the shutter to one vertical post with cane strips, permitting easy rotation of the shutter. In the case of sliding shutters, these are generally hung from a horizontal beam provided for this purpose. The shutters may be suspended either by loops of split cane or through a special bamboo detail.

In the latter, two whole bamboo lengths are modified so that they hang from the horizontal with the beam passing through the vertical culm through a hole large enough to permit easy sliding. This means that the horizontal beam is of a smaller diameter than the vertical members. Below the level of the horizontal beam the vertical members are shaped and narrowed to receive the shutter panel. The vertical members are bound firmly to both ends of the shutter with cane splits.

Pigsty Latrine

The vertical walls around the pigsty latrine constitute another significant construction technique (fig. 93). Here whole culms of bamboo cut to the required length are held between two horizontal beams of bamboo, one directly over the other at the required distance. The vertical bamboo wall elements are crafted so that at both ends deep cuts are made removing material to form parallel forked V grooves which help anchor the verticals between the two bamboo beams. Here no binding is required as the verticals stand passively between the beams (fig. 94).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Fireplace

Bamboo and wood being combustible materials, great care is taken in preparing the fireplace. At the spot chosen for the fireplace a square section of the floor is left open. Into this space is fitted a box made of wood which is recessed into the floor and supported directly from the ground on posts. This is filled in with earth upto the level of the floor and its perimeter is lined with heavy wooden sections. Three stones are set into the mud plaster to form the hearth. All the work is done essentially by hand with the use of only one tool, a *dao,* a broad-bladed knife.

94: V-groove construction of pigsty latrine wall.

95: Bamboo houses near Agartala.

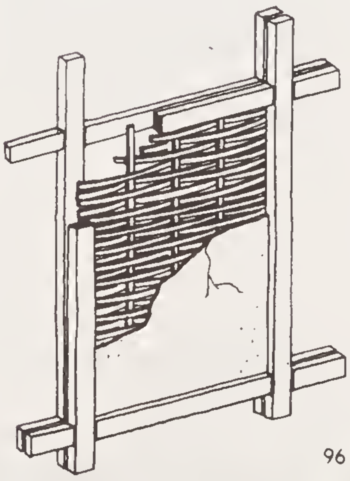
96: Bamboo infill panels used in a wooden frame.

97: Timber frame houses in Assam.

95

Bamboo Houses of Assam and Tripura

A large number of structures using bamboo as a primary material are built in the plains of Assam and Tripura. These structures may be houses, granaries, shops, workspaces or even large warehouses (fig. 95). They are of lightweight construction and able to withstand severe earthquakes; at the same time they are also wind-resistant. On close examination one finds a few basic construction principles, joints and selective combination of materials based on their availability which generate a multitude of variations.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Wooden Frame Structure

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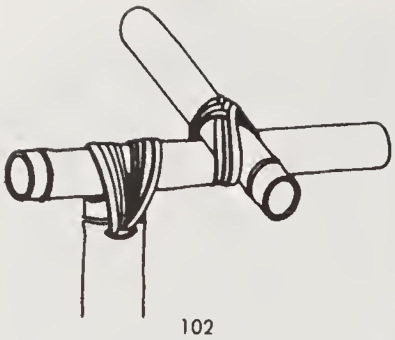
The typical Assam type house with a wooden frame construction and corrugated galvanised iron roof also uses bamboo as infill panels which are plastered with cement or mud (fig. 96). The structure seems to suggest that it evolved from houses built wholly of bamboo. Most of the buildings that serve as government offices, schools, museums and churches are of the timber frame kind so typical of Assam (fig. 97). The timber frame gives these buildings a greater degree of permanence than those built entirely of bamboo. However, low-cost constructions are best achieved using bamboo as the predominant structural material.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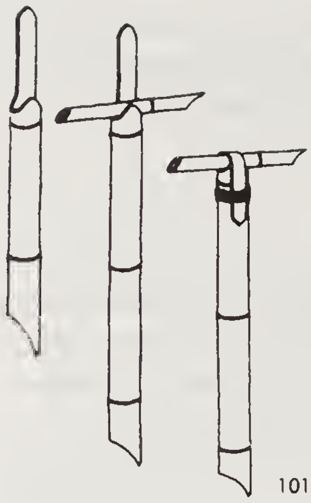
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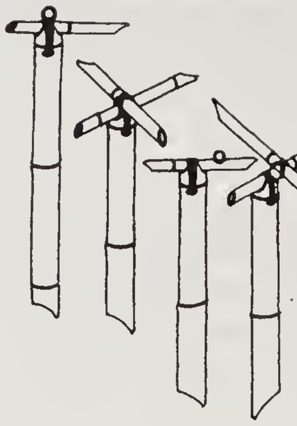
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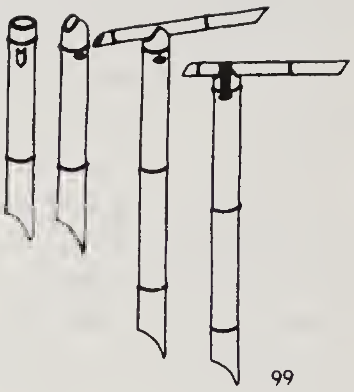
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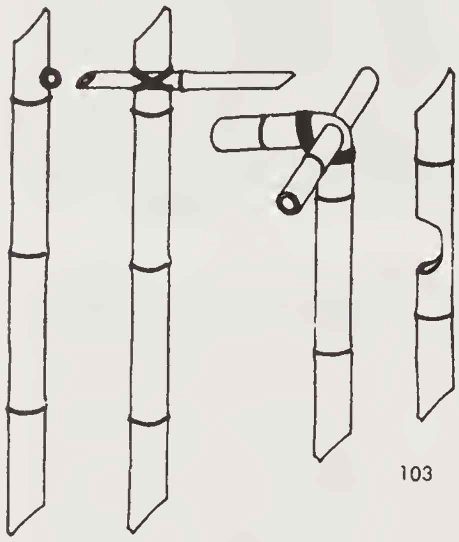
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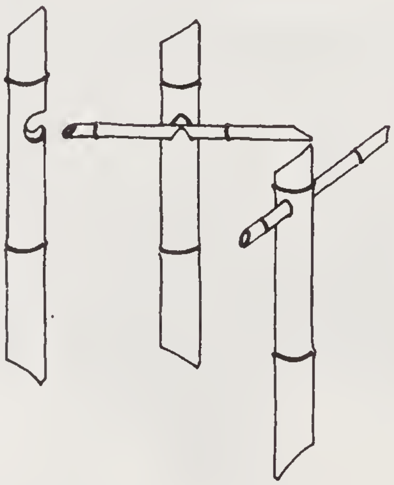

104

98: A typical bamboo house on a raised earth plinth.

99: The saddle joint.

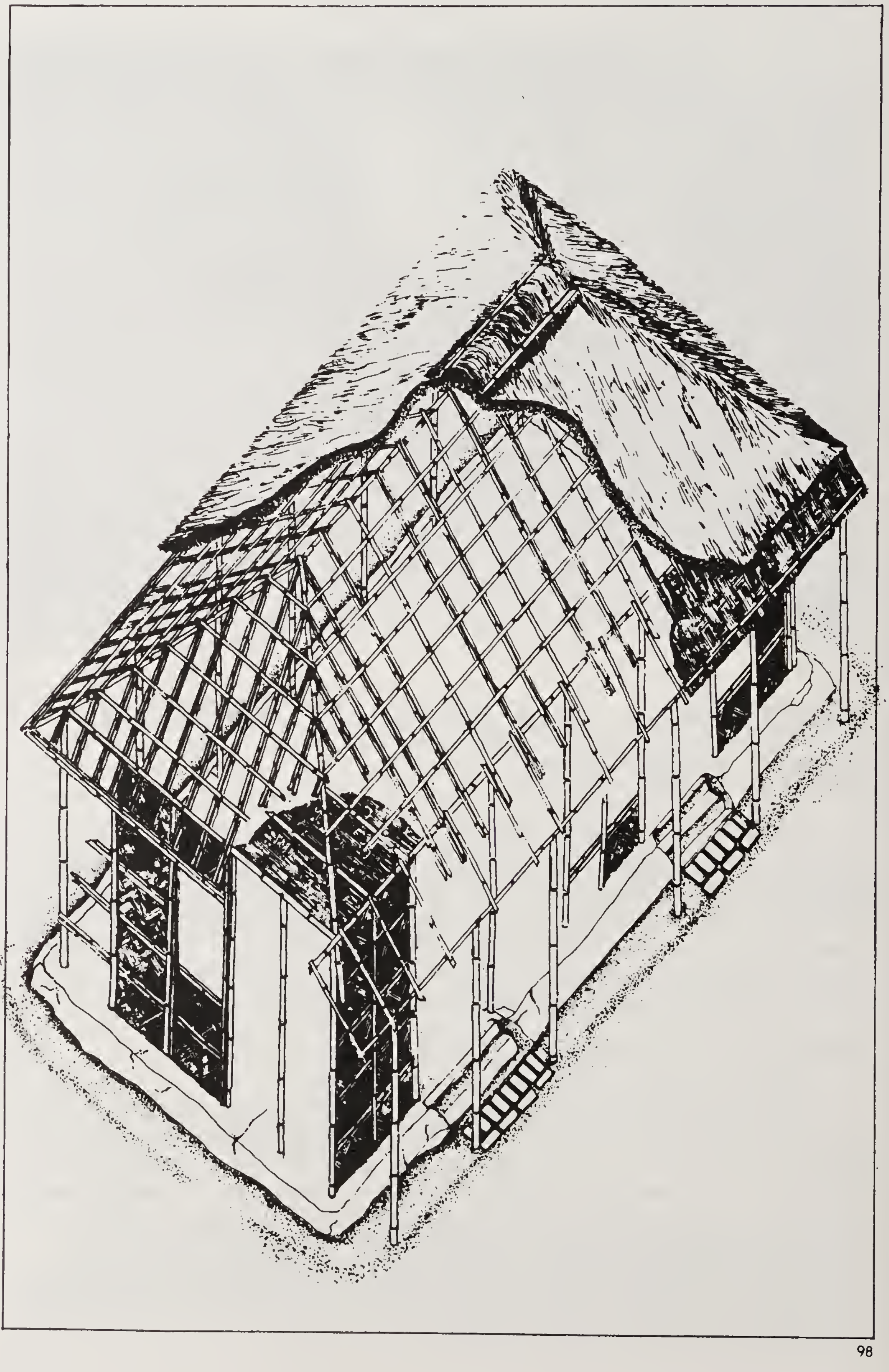
100: Variations of the saddle joint.

101: An interesting variation of the saddle joint where an extension of bamboo is bent over the beam before it is firmly bound.

102: A combination of the post, the beam and the tie beam.

103: Variations of joints between posts and beams.

104: A notch in the side of the post supports a beam when the post is to extend above it.


98

Bamboo Frame Structure

The bamboo houses of the plains are essentially ground level dwellings, unlike those built on hilly terrain which have floor platforms raised on stilts (fig. 98). The structure of these houses consists of whole bamboo posts embedded vertically in the ground, and located around a raised rectangular platform of earth filling which is rammed hard and plastered with clay. These posts may be single whole culms of a fairly large diameter, large wall thickness, and with short internodes. They are effective load-bearing members which resist deflection or bending on loading. Composite posts are also made by lashing together whole culms of a lesser diameter. Beams of whole bamboo culms are placed to link the posts around the perimeter of the rectangle. The commonly used joint in this case is the saddle joint (fig. 99) where the top of the post is cut out to form a saddle on which the beam rests and the joint is secured by binding it with bamboo splits, cane splits or lengths of galvanised iron wire. There are many variations of the saddle joint (figs. 100, 101). Tie beams are sometimes added between corresponding sets of posts on the longer sides of the rectangular plan (figs. 102-104).

The Roof

The roof structure is normally made of prefabricated panels composed of rafters and purlins lashed together and covered with grass thatch (fig. 105). The panels are made on the ground near the house, and then hoisted above the post and beam structure and secured by binding them to the beams and at the ridges so that they support and lean against each other. These roof panels are either rectangular or trapezoidal, and in either case the triangular openings at the ends of the prism formed by the roof structure have to be filled or covered. In the case of the former structure the two end walls are extended above the beam level to meet the roof, and in the latter triangular thatched roof panels are fixed along the slope created by the inclined edges of the trapezoidal panels and lashed in place.

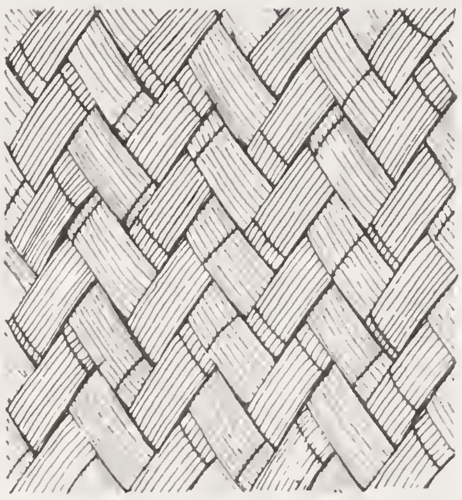
The Walls

The wall structure rests on the posts around the house. Lengths of whole bamboo of a smaller diameter are lashed on to the posts horizontally, at various heights, uniformally spaced from the bottom to the top of the posts. These run all around the house interrupted only to provide the openings necessary for the doorways and windows. These members are whole culms of a smaller diameter and wall thickness and the internode distance is also much larger than those of the posts. The upper tapering part of bamboo culms which are generally weaker than the basal part are used for these members. Woven bamboo mats (figs. 106, 107), made either from flattened bamboo boards or from coarse splits, are held against the horizontal whole bamboo members by lengths of longitudinal halves or quarters of bamboo running parallel to each of these members and lashed to the existing horizontals through the mat. These walls are plastered with mud or left exposed without surface treatment (fig. 108).

Sprung-Strip Construction

In some cases, when plastering is done, an alternative construction is adapted in lieu of the mat. In this case stiff splits of bamboo are woven into the horizontal members lashed to the posts. The horizontal members are suitably spaced apart to permit the vertical splits to be sprung around the horizontal member. Alternate splits are arranged on either side of a given horizontal at any one point. Space is provided between splits to provide for better bonding of the mud plaster on both sides of the wall. These splits are arranged closely packed if the surface is left untreated, as is the case when this construction is used in screens placed in front of doorways, located away from the opening on the outside to create a visual barrier. These screens are in many cases also made of framed matting.

105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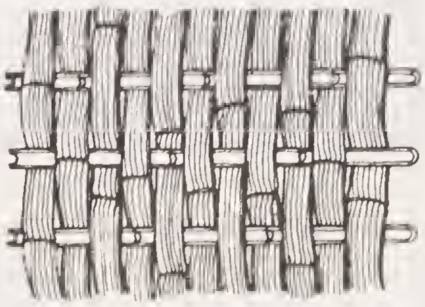
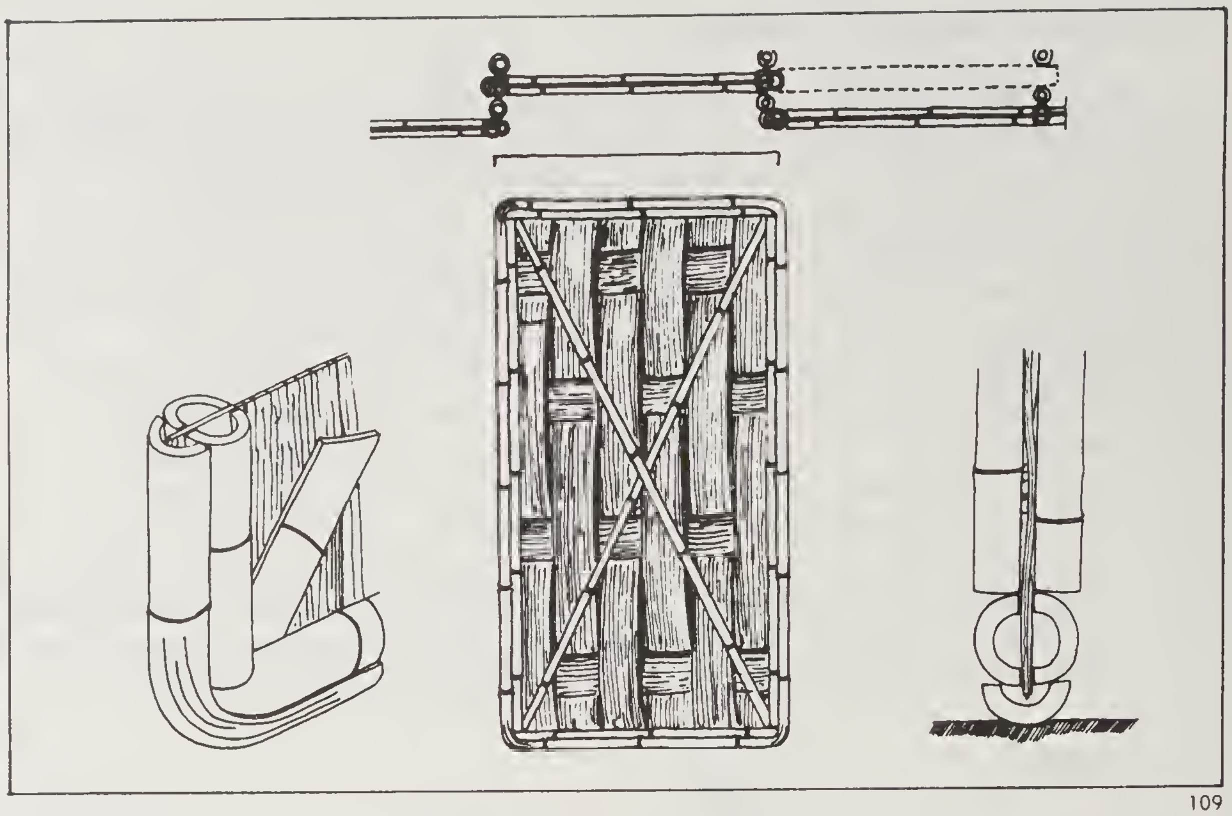

107

105: Prefabricated roof panels in Tripura.

106: Flattened bamboo boards interwoven to form wall elements.

107: Bamboo splints and flattened boards combined in walls.

108

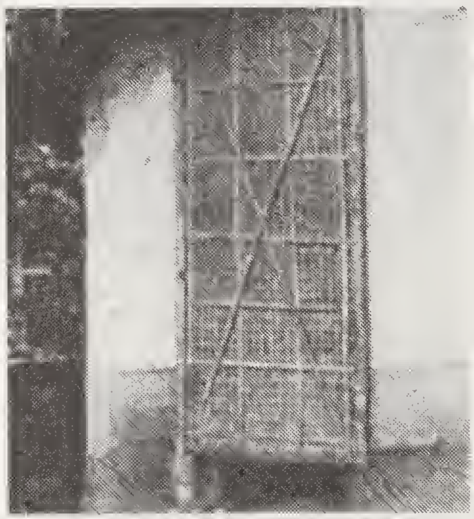


109

Doors and Windows

Shutters for doors and windows are also made of bamboo. These are of three basic types: shutters that slide across the opening, hinged shutters or pivoted shutters (fig. 109). The window shutters either slide across the opening or are hinged at the top and swing up to open. All shutters are normally mat panels framed by bamboo splits with diagonal bamboo braces. The sliding shutters for both doors and windows are hung from a whole bamboo member located above the opening and fixed sufficiently away from the wall to permit free movement. The sliding detail is composed of either a whole bamboo or longitudinal half fixed to both vertical sides of the panel and extending above the top edge. These verticals have circular or elliptical holes through which the fixed horizontal member supports the shutter. The holes are large enough to permit easy sliding.

In the hinged shutter, the hinge used is normally made by binding the shutter either to the post or a beam, using lengths of split cane or metal wire (figs. 110, 111). In the case of pivoted doors, the pivot detail is a large diameter whole culm length with diaphragm retained, which receives the whole bamboo member fixed to one side of the shutter. The vertical member rests inside the supporting member on its diaphragm and the inner diameter of the supporting member is larger than the vertical member fixed to the edge of the panel to permit easy rotation. The pivoted door can use the pivot detail both at the top and bottom of the door. In cases where the detail is only used at the bottom, cane loop hinges are used along the edge of the door shutter. Hence, such shutters work on a combination of the pivot and hinge principle, with the pivot detail preventing the shutter from sagging at the hinges.



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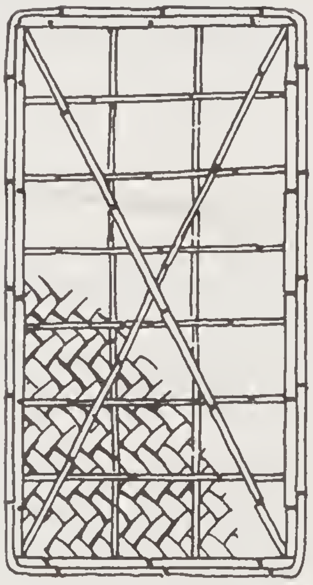
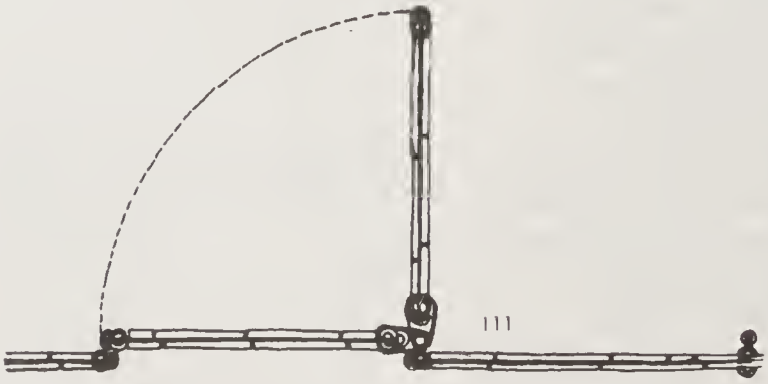




111

108: A Bengali house cluster in Cachar District with plastered walls.

109: A sliding door shutter showing details of bamboo matting, braces and elements for sliding.

110: A hinged bamboo door.

111: The plan and elevation of a hinged door.

113

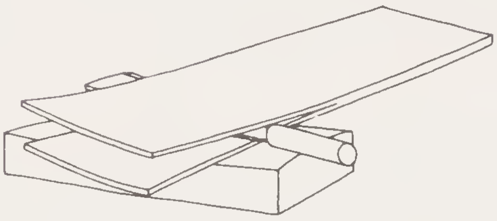
115

Badarpur Ghat

In Assam, large coarse bamboo matting is made from flattened bamboo boards. These are used as prefabricated walls and roofs, particularly in the bamboo frame Assam-type of house common in the state. Small labour-intensive cottage industries make this type of matting and two or three such industries are located at Badarpur on the banks of the Barak River (fig. 112).

In one particular industry, *Muli bans* (*Melocanna bambusoides*) is bought from a lease-holder who sells lengths of six to seven metres of bamboo in bundles of 1,000 culms to a contractor. The contractor arranges to float the bamboo down the river to the cottage industry. A number of bundles of bamboo are tied together like a raft, and a couple of men live on the raft and look after the bamboo till it reaches its destination (fig. 113).

At the cottage industry, a number of people employed by the contractor convert the culms into flattened board. The bamboo is brought out of the river and each culm is split in half along the length after the external nodal rings are cut off. The half culm is then flattened by hitting it along the length, particularly at the nodes. This is done with a wooden mallet or the back of a *dao,* a broad-bladed knife, which causes the semi-circular cross-section of the culm to crack at various places, so that it lies flat. The internal nodal walls are chopped off, and then the board is split in two through the thickness so that one board has the outer skin of bamboo while the other has the inner surface of the culm (fig. 114). These are stored separately. Each craftsman carries out all the processes required to convert a culm into the flattened board, and he is paid according to the number of boards he is able to make.


114

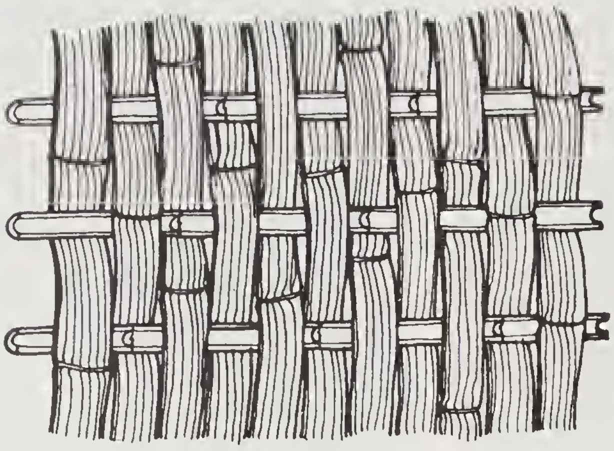
112: A cottage industry at Badarpur Ghat.

113: Bamboo rafts transported down the river.

114: The board is split with a *dao*.

115: The boards are woven into matting.

112



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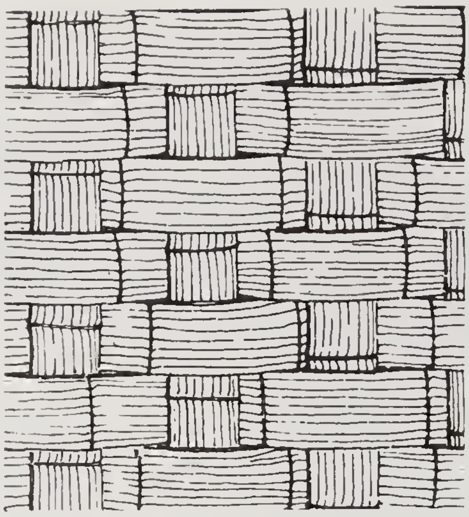

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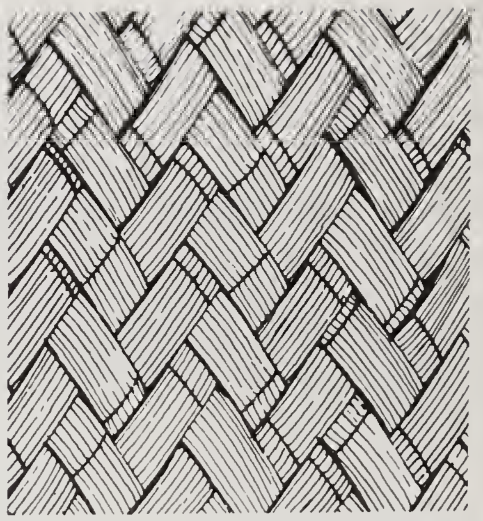

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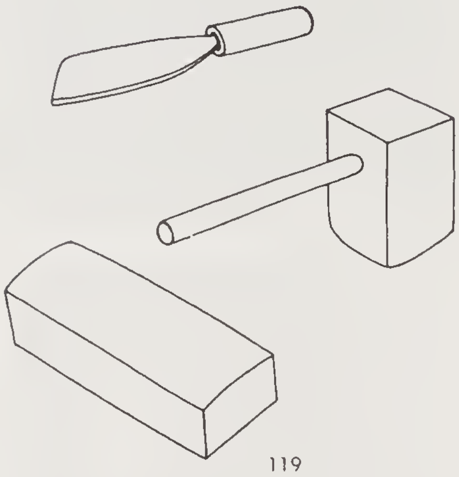


119

Some other craftsmen chop the boards into standard lengths using a bamboo stave as a measure. The *dao* is placed on the board, and hit with a mallet to cut it to the required size. A portion of the cut boards are bundled and sold as they are, others are woven into matting.

The craftsmen weave the boards into matting (fig. 115). One kind of mat is made where the boards run along the length and widely spaced half culms of bamboo are interwoven between them across the width (fig. 116). These mats are made about four by one metres in size and are used for fencing. Another type of mat is only woven with flattened boards in a tabby or twill pattern (figs. 117, 118). Here the elements are placed at an angle to the edges of the mat, which has to be trimmed after weaving. These mats are used for the walls of the houses and are made in sizes of about four by-two metres.

This type of cottage industry is entirely dependent on the craftsmen, who only use one *dao* and one mallet (fig. 119). There is no machinery at all, and the speed and skill of the craftsmen control the quantity and quality of the mat production.

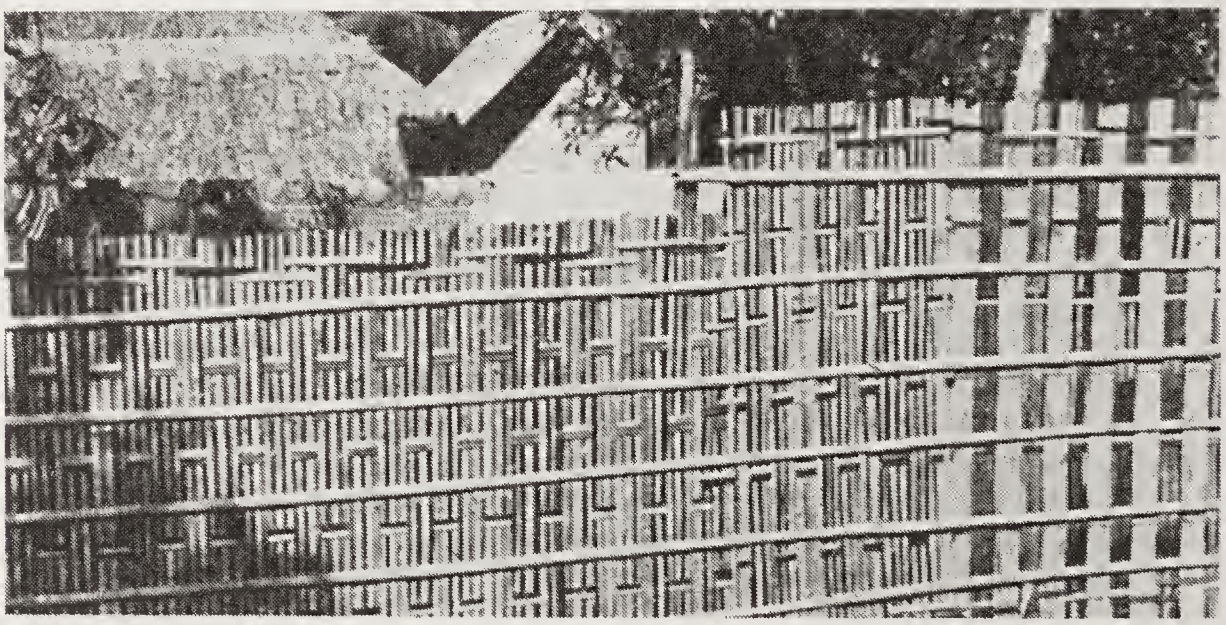
116: Half culms of bamboo woven across the width of the mat.

117: Bamboo matting in a tabby weave.

118: Plaited twill bamboo matting.

119: The *dao*, mallet and wooden block are the only tools used.

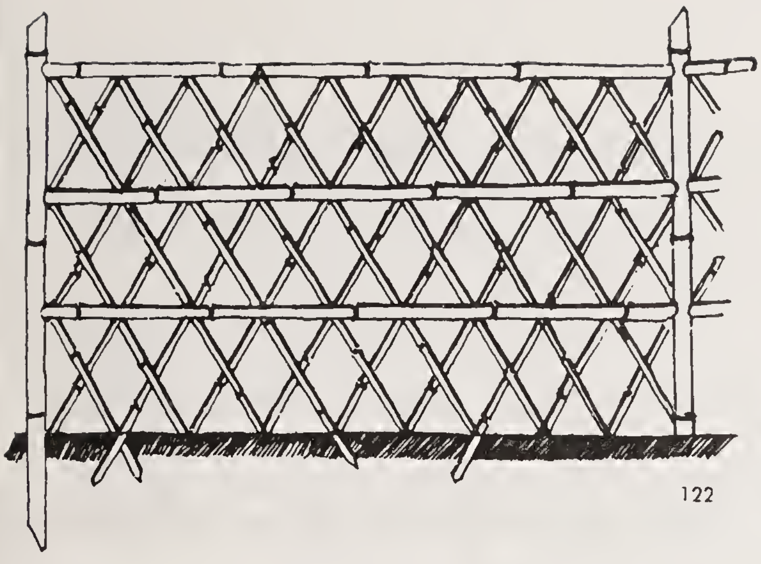
120: House fences at Agartala.



120

Bamboo Fences

Several types of fence constructions, using bamboo as a primary material, are in evidence in Northeastern India. These vary from region to region, reflecting the local understanding of the properties of the material, the state or art in terms of technology available or techniques known, and the economy of construction. The functional requirements are also deciphered from the variations of these constructions. Fences used around fields have an open rigid structure, their height being sufficient to prevent the entry of animals. In the plains, fences used around houses indicate a need for privacy, as these are generally of a close weave and extend slightly above human height to create the necessary visual barrier (fig. 120). Some of these exhibit an element of decoration.



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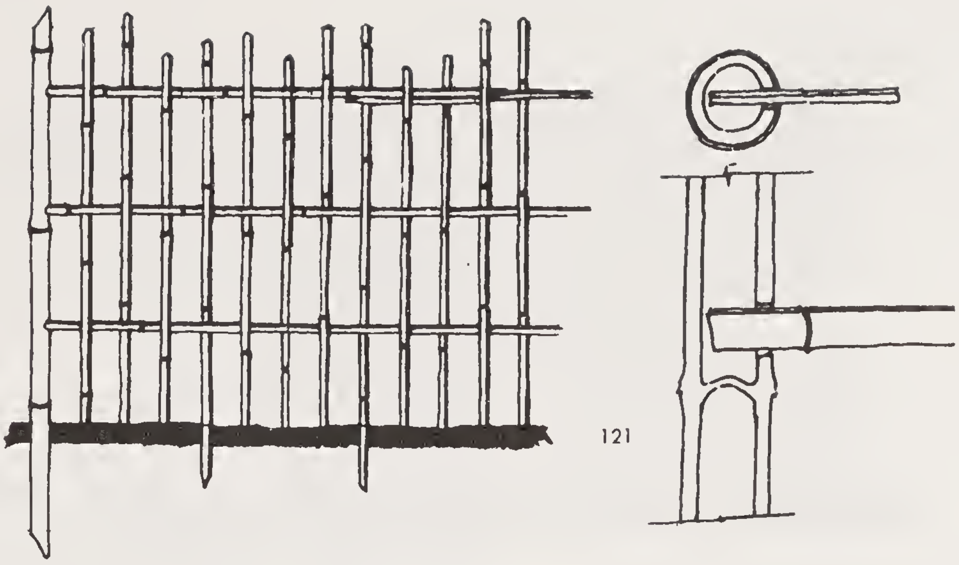


121

121: A simple open type field fence showing the joint between the post and horizontal elements.

122: An open type field fence with diagonal elements.

Field Fences of Assam, Tripura

Simple open-type field fences seen in the plains of Assam and Tripura are made of longitudinal splits of bamboo with interlacing horizontal and vertical members spaced well apart (fig. 121). In order to achieve a strong structure with an economical use of materials, combinations of whole bamboo, longitudinal halves, quarters and splits of smaller dimensions are used. Bamboo culms cut to suitable lengths are anchored in the ground and used as posts. These are spaced apart, and horizontal members of longitudinal halves are held between the posts. These may either be lashed on to the posts or attached through a housed joint, where the horizontal member penetrates the post through a hole cut in it.

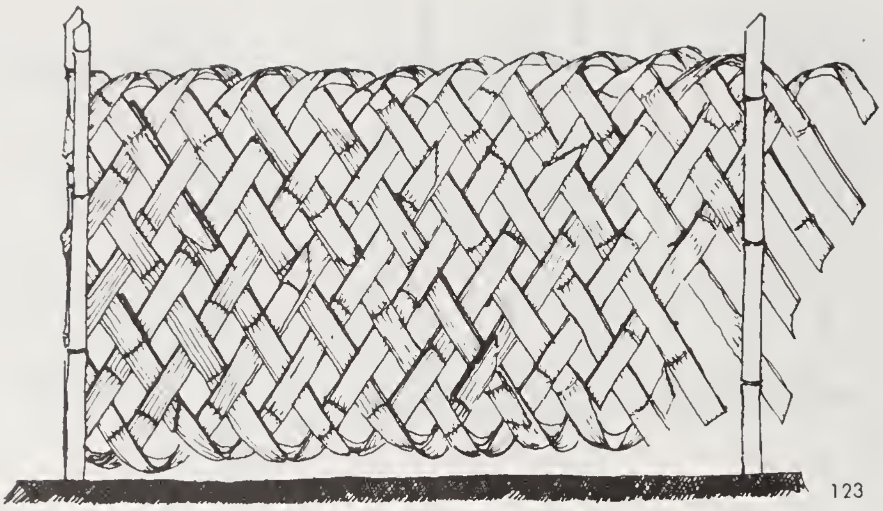
Vertical members of longitudinal quarters are woven between the rows of horizontals so as to move over and under alternate rows. These too are placed apart to leave open spaces between them. The open rectangles thus formed are selectively filled by additional splits of a smaller cross-section, by weaving them in both the horizontal and vertical axes into the existing grid, depending on the size of screen desired. Several variations are made by varying the distances between posts, horizontals and fillers. The support of standing trees or wooden posts is also used.

The interweaving of members eliminates the need for binding, thus saving on labour and avoiding the use of any special binding material. When binding is done, cane splits, lengths of wire or some locally-available fibre rope is utilised. Bamboo splits twisted to make fibrous ropes are also used as binding material.

Another variation of the open-type field fence is made by substituting all vertical members by ones placed diagonally in both directions (fig. 122). These diagonals interweave and have the horizontals woven through them. In some cases the lower ends of these inclined members are sunk into the ground and the open ends at the top are held sandwiched between two or more horizontal members lashed together to create a strong upper edge.

Monpa Field Fence

A third type of field fence, seen near Dirang in Kameng District of Arunachal, is built by the Monpas who live there. This fence is made by flattening bamboo culms of a small outer diameter and wall thickness, to form sheets which are about 35 to 45 mm wide—equal to the circumference of the bamboo. Here a desirable height of fence is pre-determined by the width of the woven mats. Continuous diagonal sheets are interwoven in one direction till these reach the edge of the fence structure. These diagonals twist around the edge and return inclined in the opposite direction across the face of the fence, weaving into the already existing diagonals. The diagonals are spaced apart to leave rhombic spaces between them. These fences are woven like a mat of continuous running length, of fixed width, and are later propped up against posts (fig. 123).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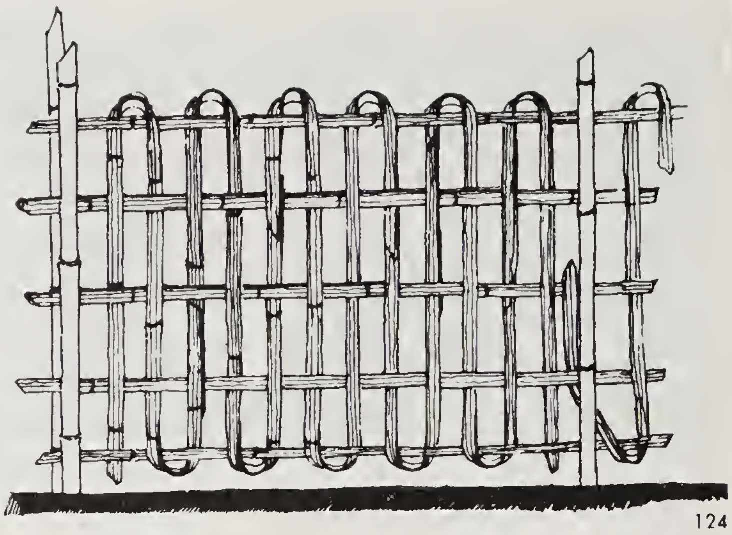

124

123: A Monpa field fence.

124: Another type of Monpa field fence.

Another variation of this type of fence, also built by the Monpas, uses bamboo sheets in the vertical direction instead of diagonally. These twist around the edge in a semi-circular arc and return across the face of the fence weaving into the horizontal members. The semi-circular arcs at both ends ensure that sufficient space is maintained between the consecutive verticals. The bamboo is used here as the weft in fabric, going over the edge of the fabric to return, weaving across the warp (fig. 124).

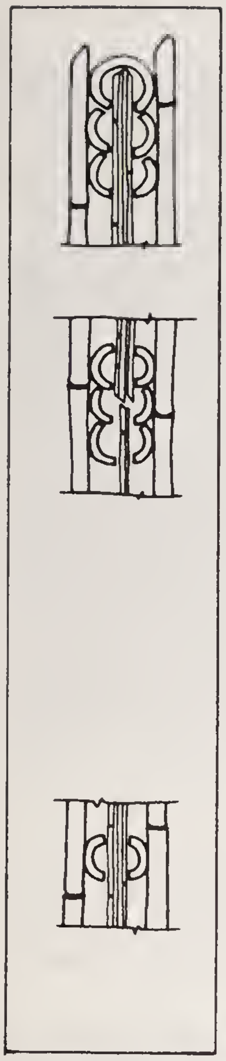
House Fences

Fences around houses in the plains of Assam and Tripura use bamboo boards made by flattening whole culms, 50 to 75 mm in diameter. Normally *Muli bans* (*Melaconna bambusoides*) is used in the Cachar District of Assam and in Tripura. The fences are of the closed type, with the boards woven closely packed together, without any gaps. The plain weave, the twill weave and occasionally a decorative variation of the twill pattern are used (fig. 125). The twill weave structure with the elements taken diagonally as in braiding is predominantly used.

Bamboo boards are used to prepare rectangular mats, the edges of which are strengthened by sandwiching between one or more pairs of longitudinal halves of bamboo which are bound to each other either through gaps in the flattened board or through holes made in the boards with an awl or any other pointed instrument (fig. 126). The outer edges are then covered by one length of longitudinally-halved bamboo which forms a strengthening element in the shape of a U around the edge of the mat. Here the binding is usually done using lengths of galvanised iron wire.

These fences usually extend above human height and have an open-work border made of bamboo splits woven diagonally above the upper edge of the mat. The diagonal members are held between the horizontal strengthening members at the top edge of the mat. The upper edge of the open border is also strengthened by sandwiching it between rows of closely-placed horizontals bound to each other. The strengthening elements at the vertical edges of the mat continue upwards to hold and finish the edge of the open-work border. These framed units of mat and open-work are much longer in relation to their height. Additional members of longitudinal halves of bamboo are placed vertically and horizontally over the face of the fence in pairs, one or two on each side, and bound to each other through the mat or open-work area to give the whole surface the necessary rigidity (fig. 127).

The frames are then propped up on whole bamboo pegs driven into the ground, such that the lower edge of the fence is well above ground level to protect the main part of the fence from rot (fig. 128). The fence is supported by whole bamboo posts anchored in the ground and spaced apart as necessary. Great care is taken in making these fences as they face the road and continue around the house. They can also be obtained prefabricated by professional craftsmen or contractors.



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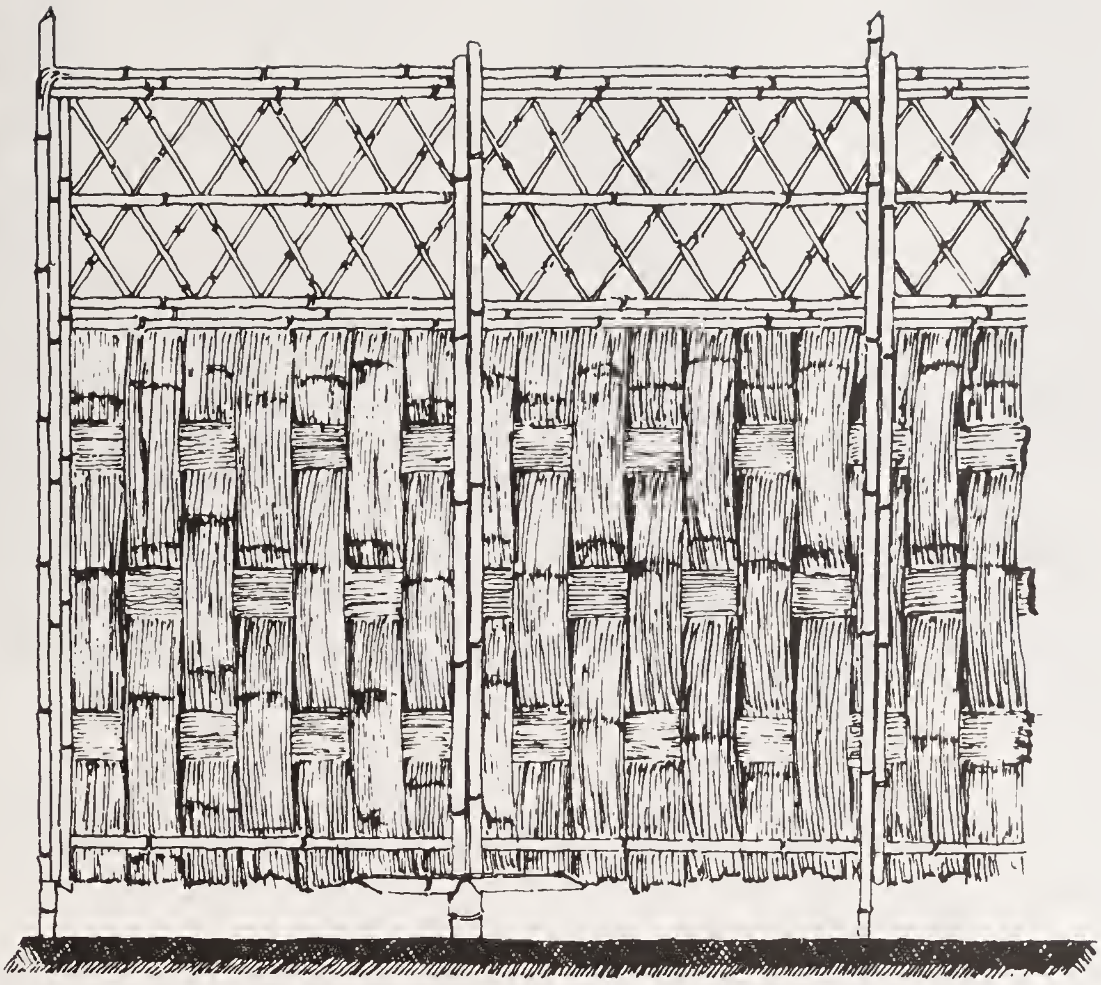

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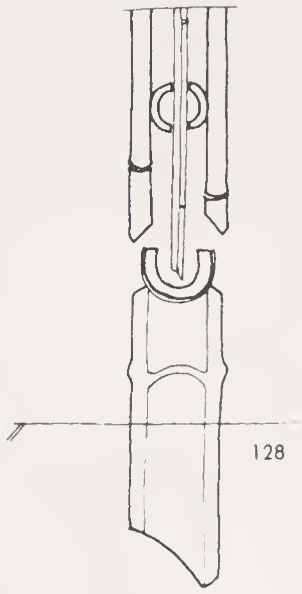

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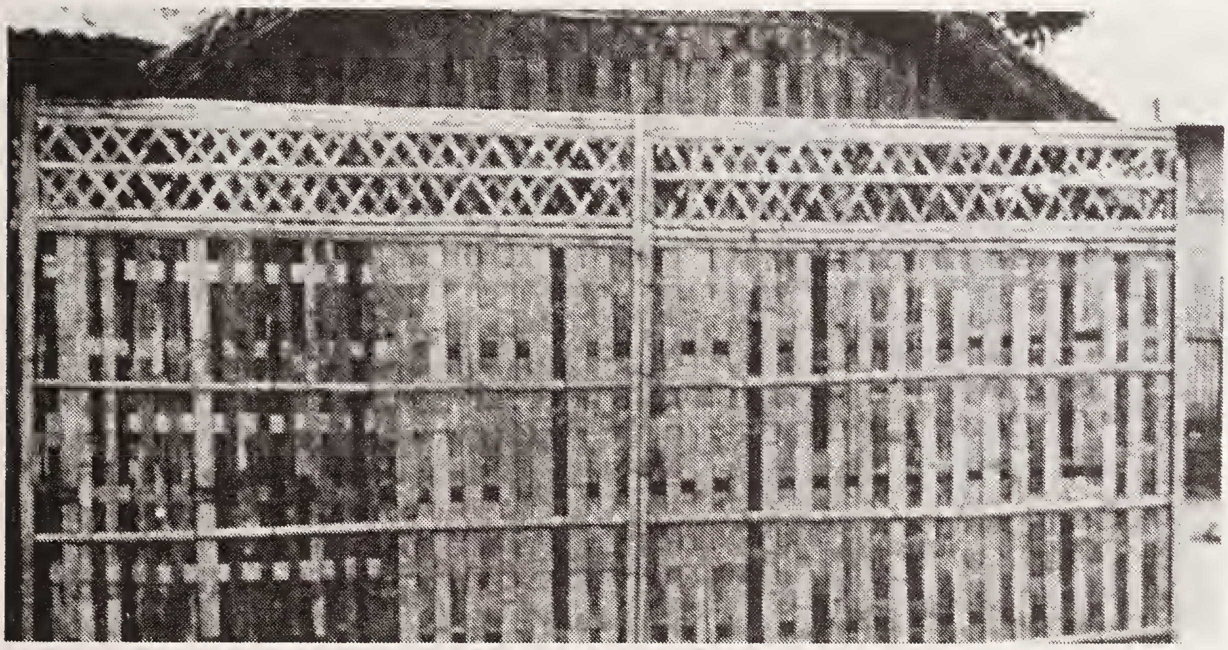


125

125: A house fence in Tripura.

126: The flattened board mat and open grill in a Tripura house fence.

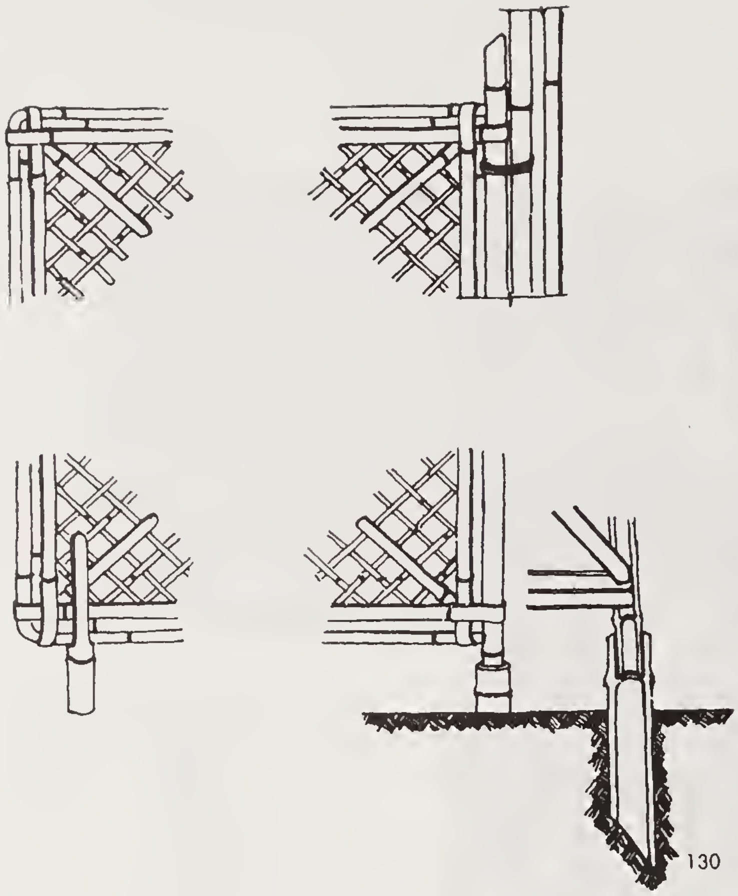
127: The use of longitudinal halves of bamboo make the mats rigid at the upper and lower edges.

128: Detail of the fence mounting.

Bamboo Gates

Several types of bamboo gates can be seen in the region. In Assam and Manipur, especially in the plains around Imphal, simple gates are made by placing two or three whole bamboo lengths horizontally one above the other to create a barrier between posts. The horizontal members can be slid individually across the passage to clear the way. These poles are housed in holes in the posts on either side of the passage, and the hole in the post is large enough to permit easy sliding. These posts may be either large diameter whole bamboos or wooden planks driven into the ground. The gates are used for both houses and fields.

In Assam and Tripura, some bamboo gates are made of panels which open on a hinge or pivot. Others are fabricated panels that slide along a groove on the floor while the panel is held up between two posts. The hinged or pivoted gates are also made of fabricated rectangular panels



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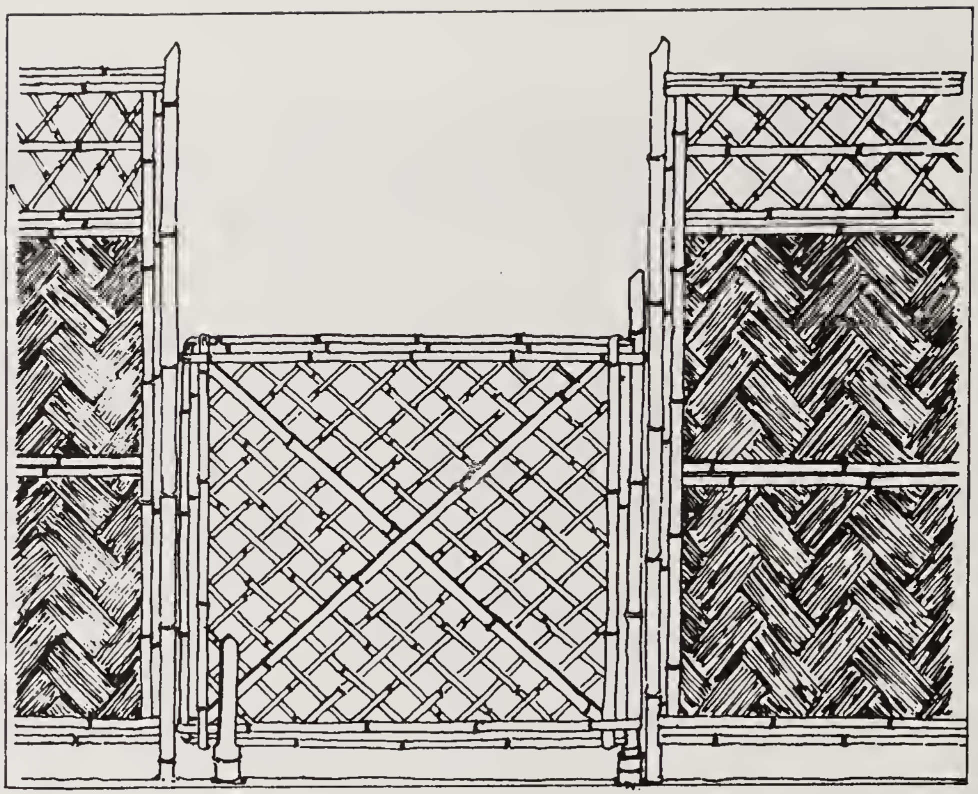


129

129: A pivoted bamboo gate from Assam.

130: Details of the four corners of the pivoted gate and a section at the pivot.

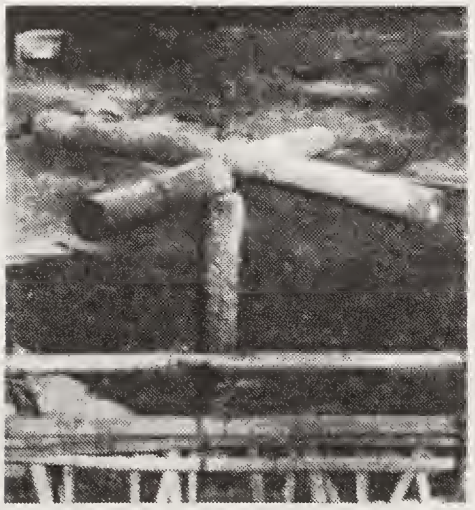
131: An Adi Gallong tribal using the bamboo stile.

132: A turnstile seen in Imphal.

(figs. 129, 130). The panels are made of bamboo splits in an open diagonal weave, with the edges strengthened. Cane or wire binding acts as a hinge, and in some cases the gate panel is raised above the ground level by a bamboo peg connected to the outer edge of the gate. In this case the gate has to be lifted slightly before it can be swung open.

In the case of pivoted gates, one edge of the gate is attached to a whole bamboo member. The lower end of this member rests in a pivot housing. This housing is made of a vertical length of whole bamboo, with a nodal diaphragm retained slightly below the upper edge. The inner diameter of the housing is larger than the outer diameter of the pivoting post. The upper part of the gate is held upright by a cane split, loosely looped around a fixed post which is parallel to the pivoted post. The pivoted post is much higher than the gate panel. A tensioning element made of twisted cane or fibre connects the top of the pivoted post to the top of the outer edge of the gate, preventing the bottom of the gate from dragging along the ground. Some gates are connected to a natural spring made of a flexible branch held in the ground, so that the gate swings shut when released. Several indigenous variations of this are found.

131



132

Bamboo Stiles

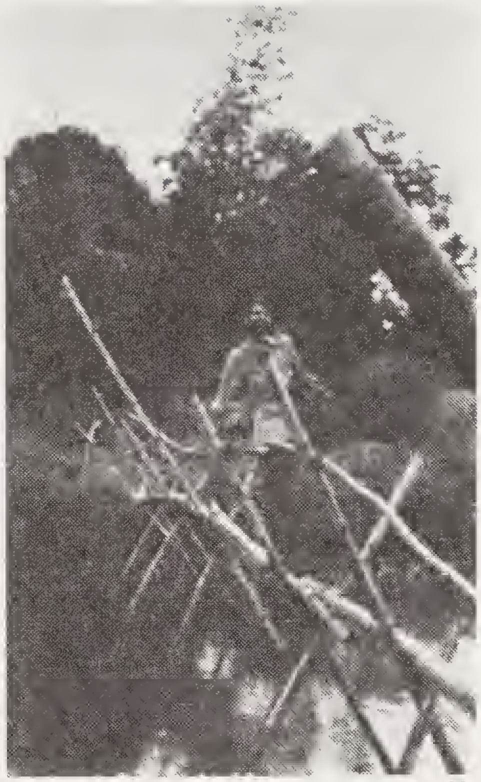
In order for people to be able to cross barriers such as fences or stockades and at the same time prevent the passage of animals, bamboo stiles are built at selected points of the fences. Some are as simple as placing two inclined ladders on either side of a strengthened portion of the fence. The ladders may either be fabricated or made from a larger-diameter whole culm length which is notched at intervals to provide footholds. For the uninitiated, these are quite precarious. Some stiles are more elaborate, with the addition of hand-rails on one side and a platform at the top. The platform may be supported by the fence or made as an independent structure. The Gallong tribals of Arunachal Pradesh build their stiles like a bridge over the fence (fig. 131). The walkway is a single whole culm of bamboo supported on posts with another whole culm located at a convenient height to act as a hand-rail. Access to the walkway is over a notched wood or bamboo ladder at both ends of the bridge.

In Imphal an interesting revolving stile was seen. This was a horizontal "cross" made from whole culms, and pivoted at the centre on a bamboo post located in a gap in the fence. The bamboo joint used is interesting and is devoid of any metal hardware (fig. 132).

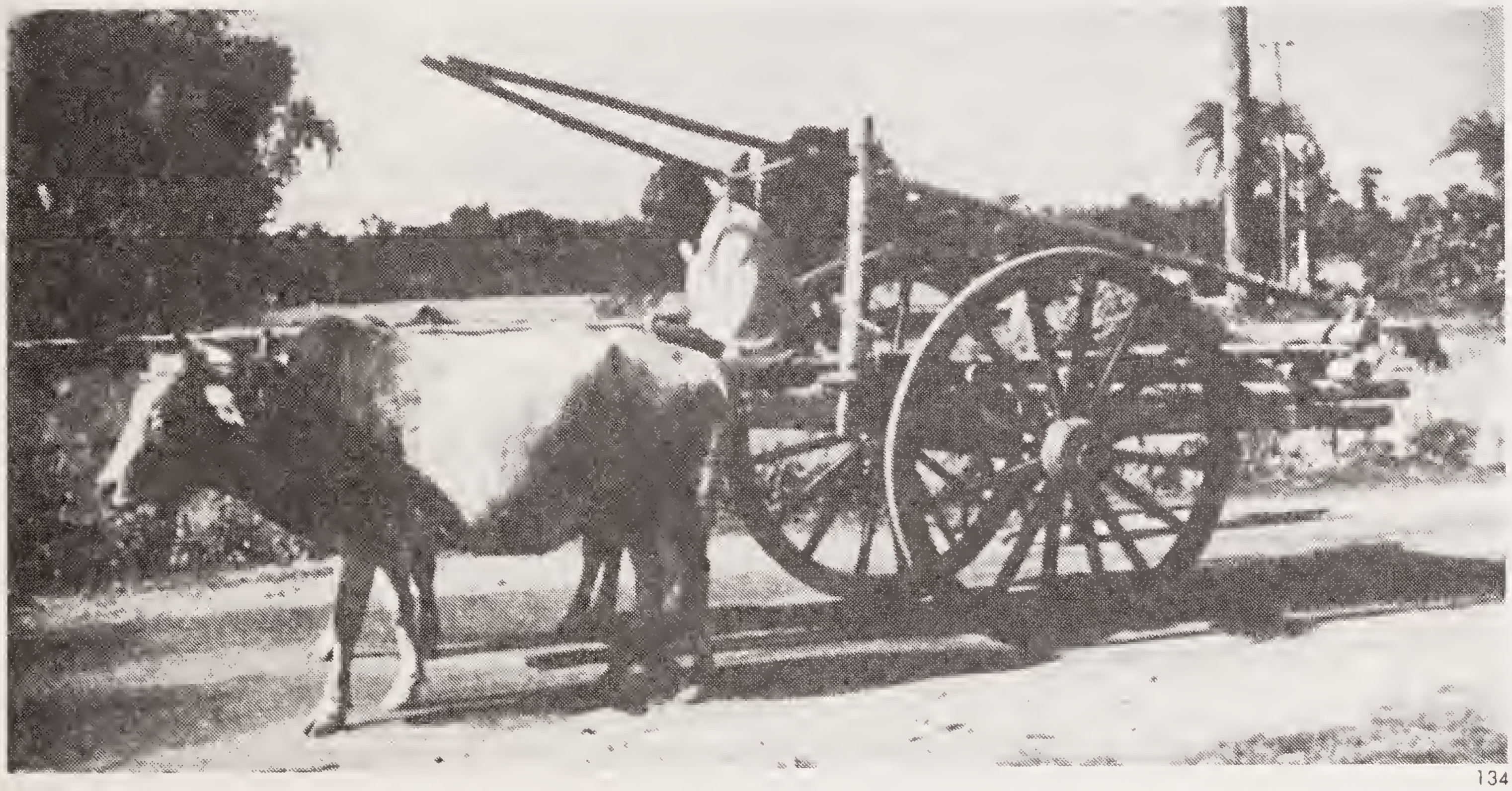
Bamboo Bridges

A cross-country walk in the plains of Assam will reveal that the terrain is criss-crossed by waterways, irrigation canals and drainage ditches which are necessary to handle the great amounts of water that collect due to the heavy monsoon rains. Several ingenious solutions in the form of bridges and bamboo structures exist to cross these obstacles. The simplest of these is the single beam bamboo bridge. This has a single whole culm supported horizontally over a series of crossed braces sunk into the ground. One side of the crossed members extends above the walk-rail to support a hand-rail at about waist level (fig. 133). It is significant that only one hand-rail is used because people crossing the bridge usually carry loads on a beam over the shoulder. Hence sufficient space needs to be provided for man and load while one hand is free to grip the hand-rail, located on the side opposite the load. Some of these single beam bridges are fairly long, with two or more whole culms overlapped and joined to span the ditch.

Wider walkways across drainage ditches are used in front of houses in Assam, connecting the house to the road. These are made on a bamboo or wooden framework with a strong mat of woven bamboo boards forming the floor of the walkway. The same principle is used in making longer walk-bridges across rivers and canals in Assam. One such bridge was seen at Koroibari near Nilambazar in Cachar District of Assam. The binding of the bamboo structure consists of wire or fibre ropes.


133

133: A single beam bamboo bridge in Assam.


134

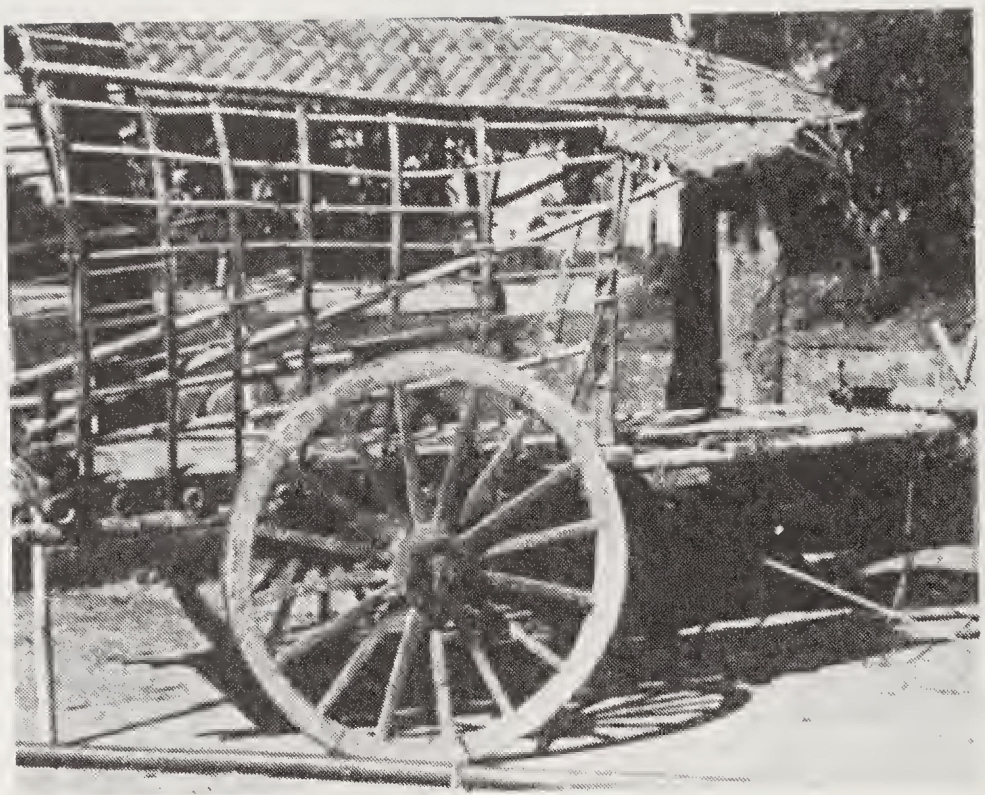
134: A bamboo bullock cart seen at Nalbari.

Bamboo Bullock Carts

Bullock carts made of bamboo and wood are used in the plains of Assam and Manipur (figs. 134-137). The type of cart described here is found in the Kamrup District. Bamboo is used structurally in the bed, yoke, yokeshaft and super-structure of the cart while the wheel, axis block and main chassis are made of wood. These carts are seen in two variations, with or without a hood made of bamboo splits and matting.

Structure

The chassis of the cart consists of two long wooden elements of fairly short cross-section mounted on a heavy wooden axle block. The cart has two large wheels made of wood, one on each side, with a metal axle supporting the axle block. The rest of the structure is made of bamboo



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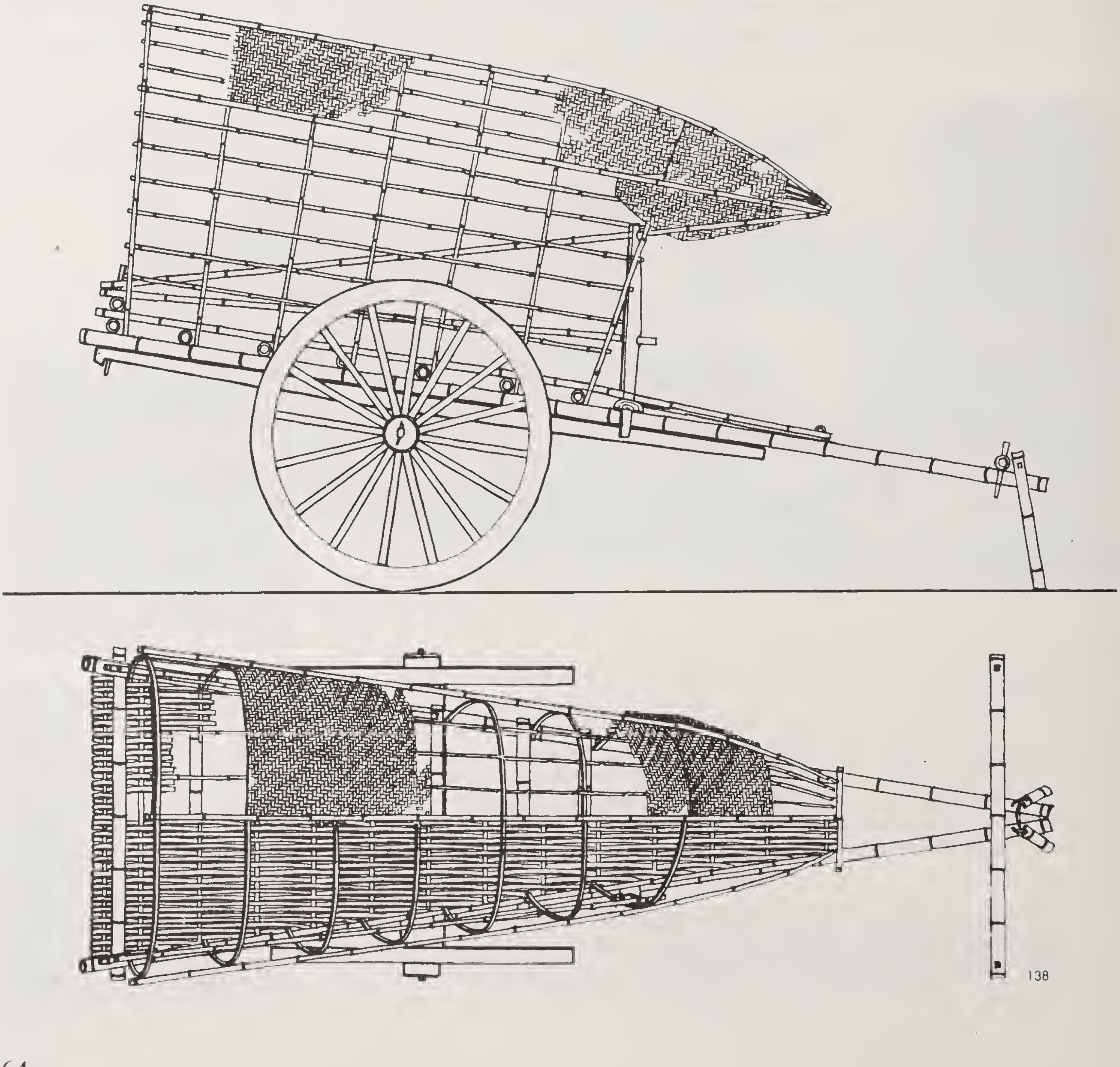

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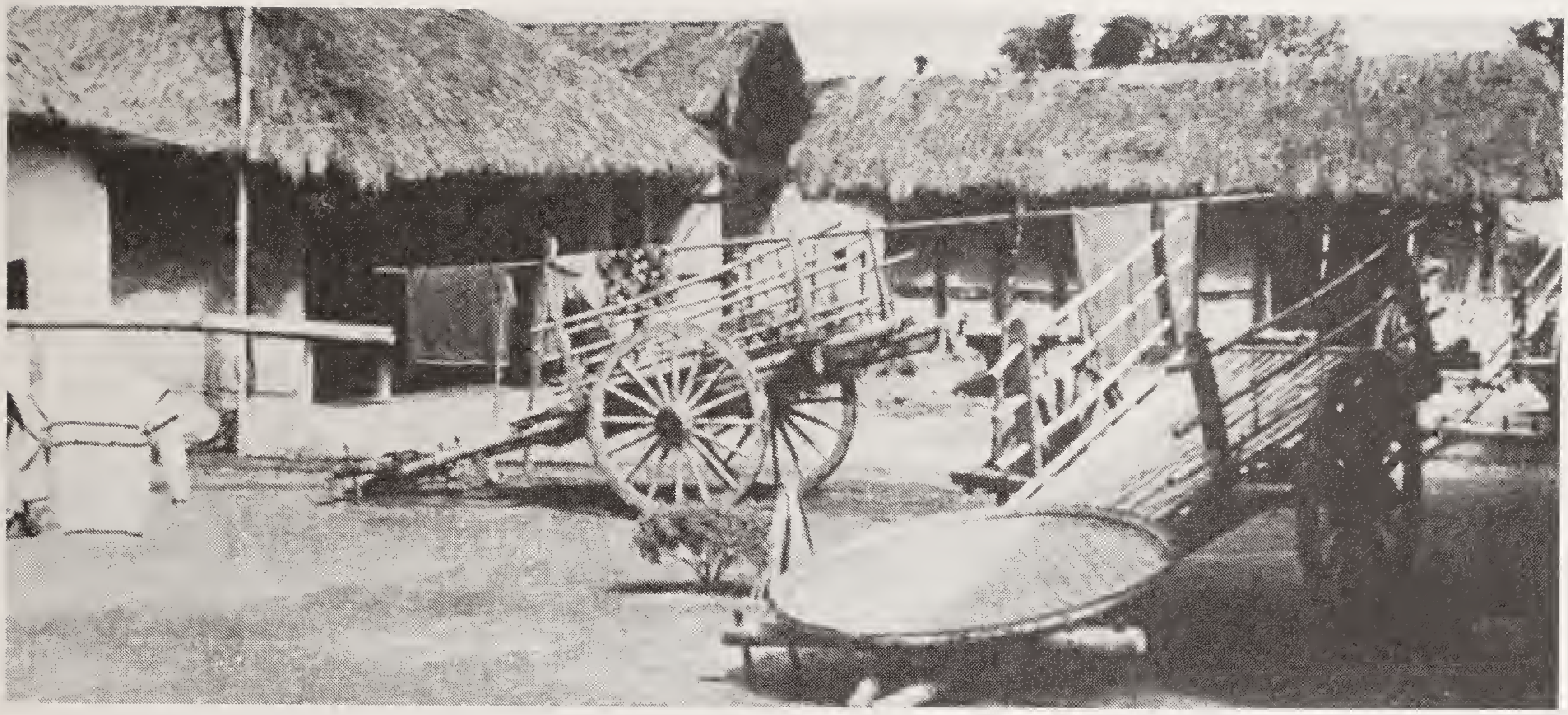

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(fig. 138). The bed of the cart is a long isoceles triangle with its base forming the rear of the cart. Two whole bamboo longitudinal beams placed on top of each wooden chassis form the longer sides of the triangle. The yoke, a length of whole bamboo of a larger diameter is bound across the two beams before the point where they meet. Several whole bamboo cross-beams are placed over the longitudinal beams and are uniformly spaced over the bed of the cart. The floor of the cart is made of split bamboo woven as in the sprung-strip construction placed on top of the cross-beams. Two longitudinal half-sections of bamboo are then fixed along the chassis on top of the mat, sandwiching it in place.

135: A bullock cart without a hood.

136: A bullock cart with a hood.

137: Bullock carts in Manipur.

138: A plan and elevation of a bullock cart from Assam.

Towards the front of the cart a wide wooden plank is placed over the longitudinal beams in the place of a whole bamboo cross-beam. This plank supports the weight of the cartman and both ends of the plank extend outside the bed of the cart to receive bamboo posts which support the bamboo side rails. The posts are housed in holes provided in the plank and the side rails in turn are housed in holes in the post. Hence the posts are made of fairly large diameter bamboo with a large wall thickness and short internode distance which has been split into longitudinal halves and each section is used on either side of the cart. There are two rails of whole bamboo on each side placed one above the other. Rails on each side meet at the back of the cart at a point above the last cross-beam. These rails diverge from this point to pass through two holes spaced well apart in the posts. All the members that overlap at the back corners of the cart are held in place by wooden pegs driven vertically through axially aligned holes in each member. The significant structural aspect in this cart is the manner in which triangulation of elements creates a rigid structure in spite of the housed joints being fairly loose.

The structure of the hood which is optional is made of bamboo splits topped by bamboo matting. The lengths of bamboo splits used in the hood form a series of arches along the length of the cart. Each split is bent like a bow and the ends pass over the side rails and the cart bed on each side before being introduced between the longitudinal beams above the wooden chassis. These splits self-lock against the longitudinal members due to the tension in the bent split which keeps it firmly in place. These arches are linked to each other by three whole bamboo runners at the top of the arch. The open spaces between the main splits are selectively filled in with finer splits. Bamboo matting is added on top of this structure to complete the hood.

Furniture

Colonial Cane Furniture

A large number of cottage and small-scale industries in Assam and other Northeastern states are involved in the manufacture of cane furniture. Assam has the major share of these units. The major cities and towns of the neighbouring states have few furniture-producing units despite the fact that these states are major producers of cane. These small units cater primarily to local needs. Only a few of the manufacturers are able to supply upcountry and export requirements though there is a large potential market (figs. 139, 140). All the major cities and towns of Assam have their share of manufacturing units with a greater concentration in Silchar, Tezpur, Dibrugarh, Gauhati, Majuli and Mangaldoi.

139

140

141

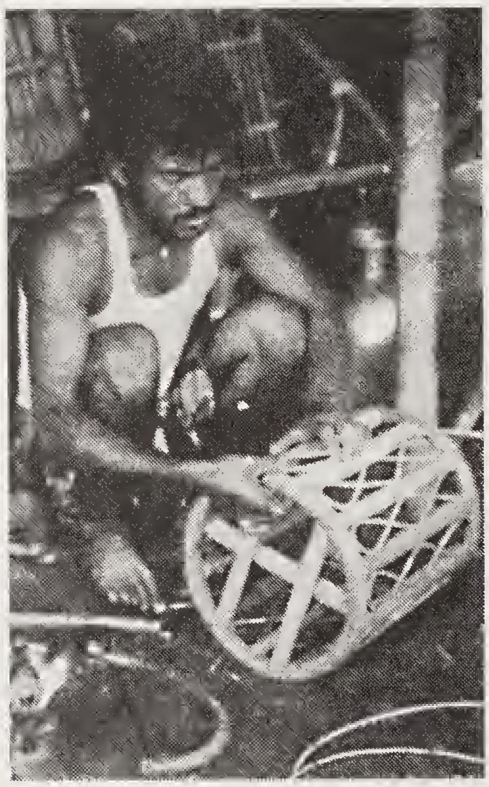
139: A concentration of small cane furniture units in Silchar.

140: A cane furniture unit in Sildhubhi village.

141: A skilled craftsman making even strips of cane using indigenous tools.

Technology and Tools

The technology used and the repertoire of design solutions are basically the same at all these centres where differences in the quality of the end product are related to the availability of skilled craftsmen (fig. 141). The method of production employed is based on skilled hand-work with the aid of a few hand-tools. The splitting tool is a bill-hook *dao* which is held in a special frame made in the shape of the letter A (fig. 142). This is used for preparing the lengths of split cane used in the binding details of the furniture. For cutting lengths of whole cane an improvised hack-saw is used. This tool is generally made of a length of stout cane bent in the shape of a bow to which a standard hack-saw blade is attached with nails. Kerosene blow-lamps are used for heating the cane before bending it to the required



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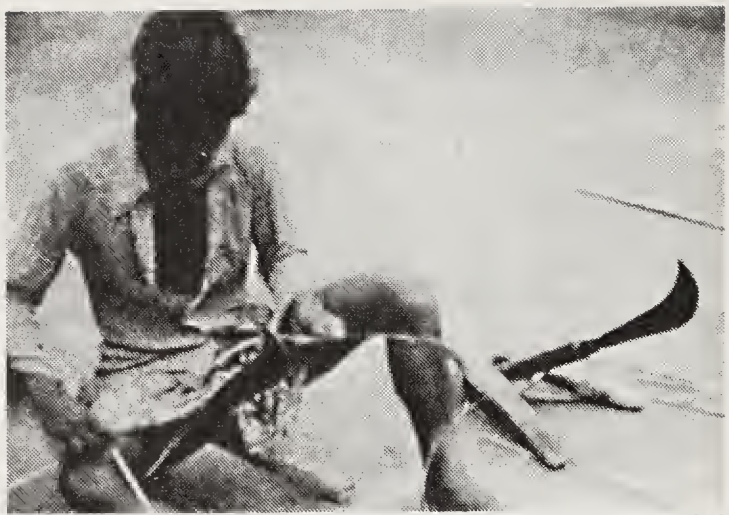

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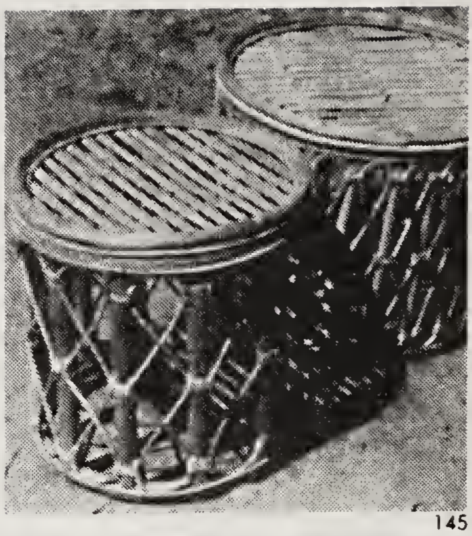

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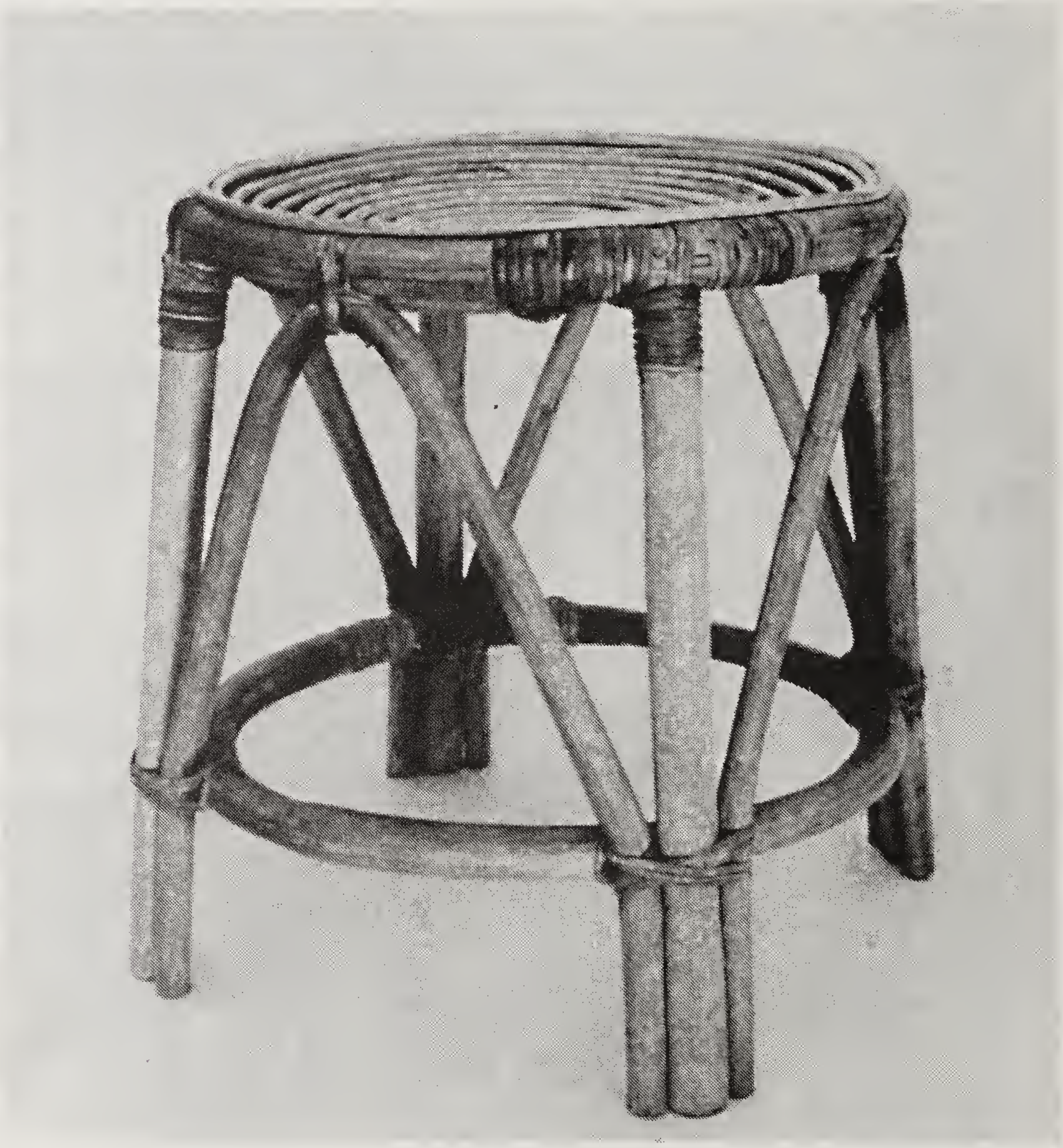
142: The *dao* and frame in use.

143: A stool being made with the aid of a blow-torch and improvised hack-saw.

144: A simple cane stool.

145: A set of nesting cane stools.

146: Sofa chairs on display in Silchar.



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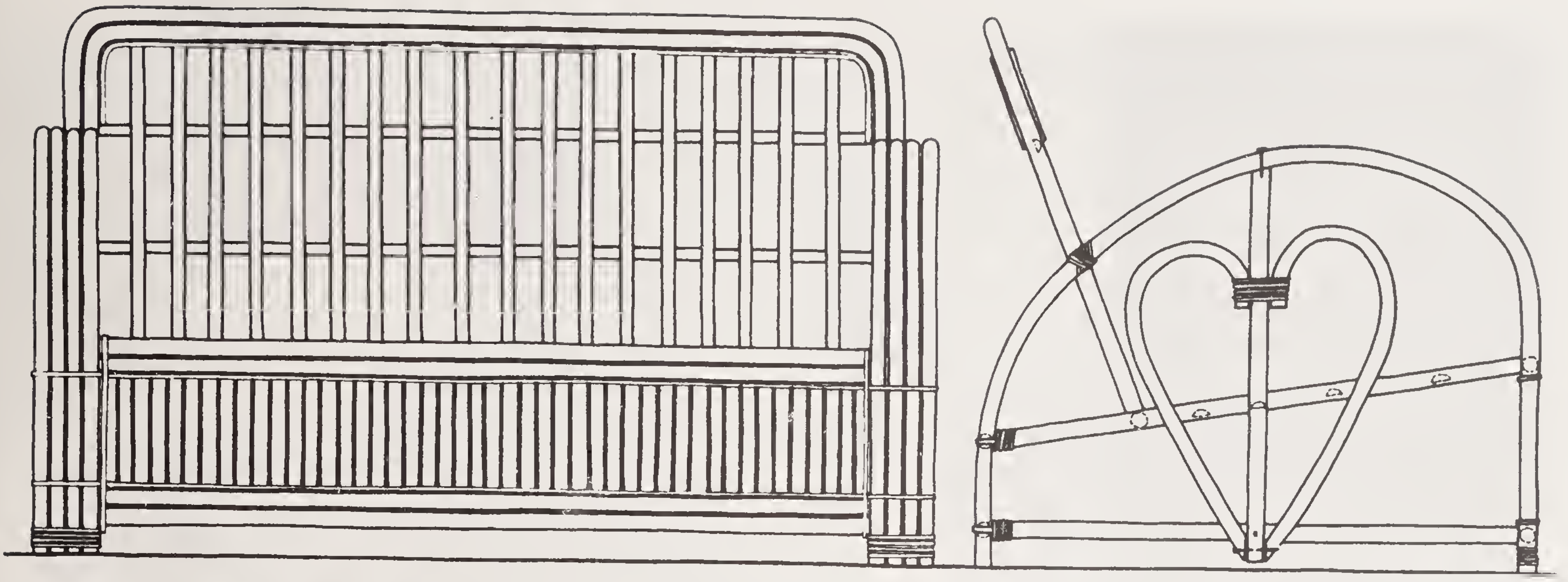
shape and in this process a wooden holding block is used. This holding block is about 600 mm long of a rectangular cross-section. One end is rounded to form the handle while near its other end a notch large enough to receive whole cane is provided. Besides these tools the only other tools required are a few small knives for scraping the surface of the cane as part of the finishing process and some metal pokers for piercing holes in the cane once the metal tip has been made red hot with a blow-lamp (fig. 143).

Product Range

The range of designs seen at all the centres are more or less the same in structure and form. It includes (1) a few variations of stools (figs. 144, 145); (2) sofa sets, made up generally of one two-seater sofa, two one-seater sofas,



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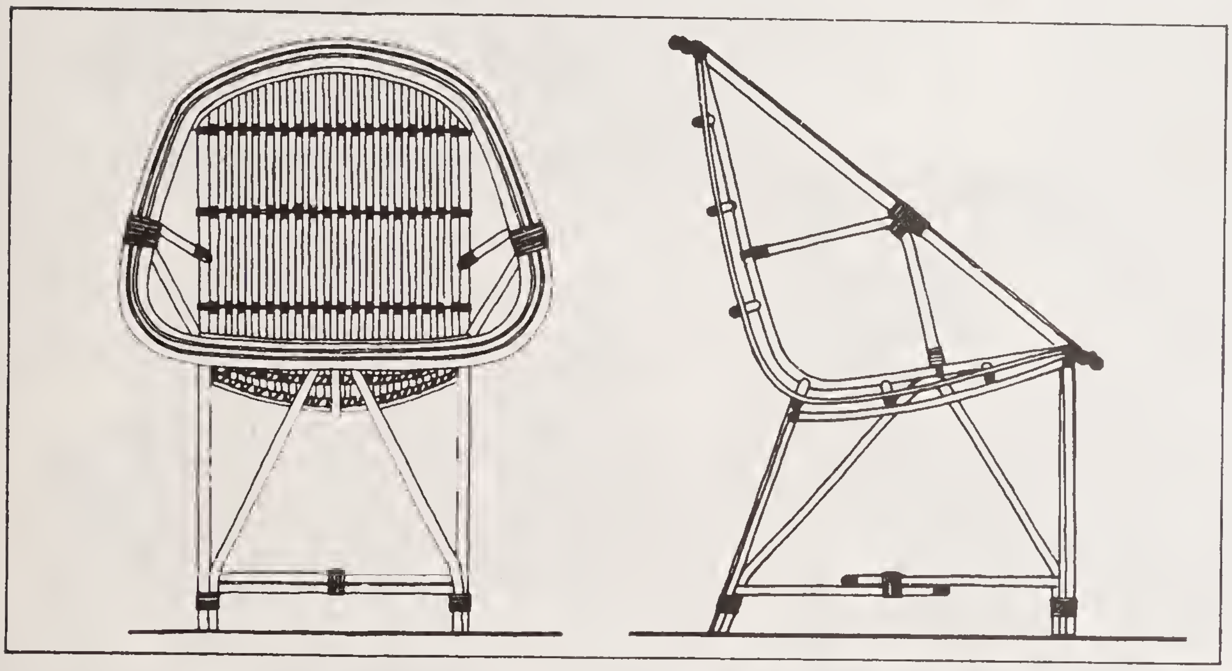
147: Front and side elevation of a two-seater sofa made from whole cane.

148: Front and side elevation of a single-seater bucket chair made from whole cane.

149: An exploded view showing the construction of a cane centre table.

150: Detail of the table top.



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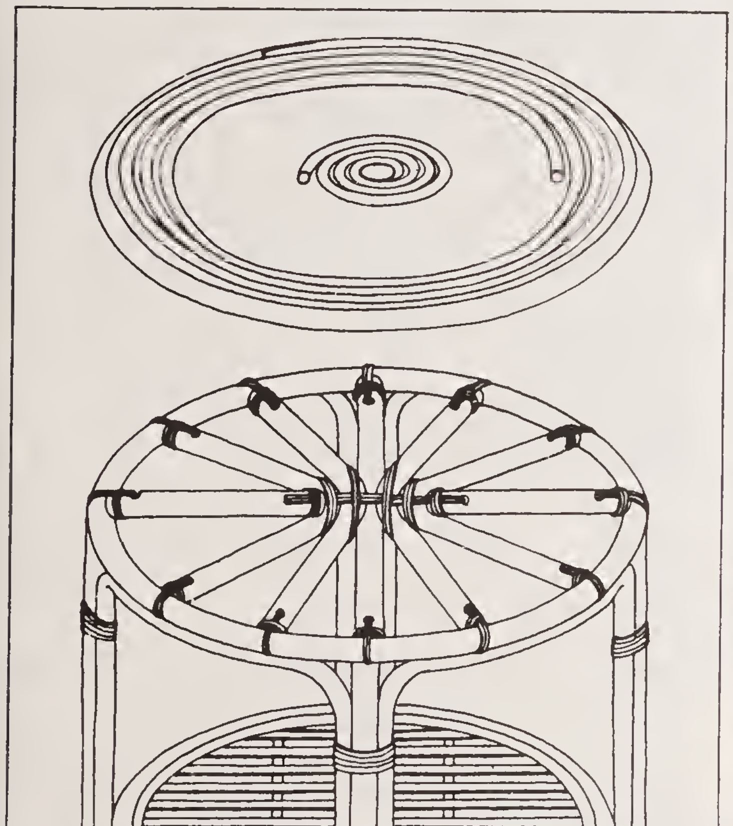

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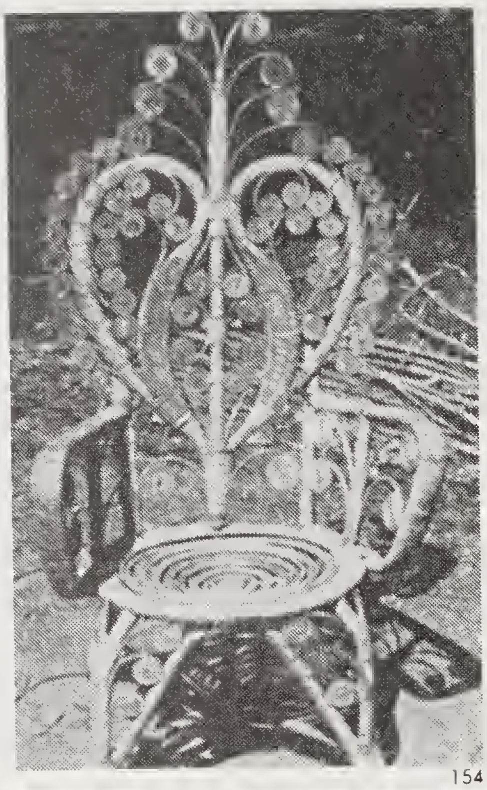

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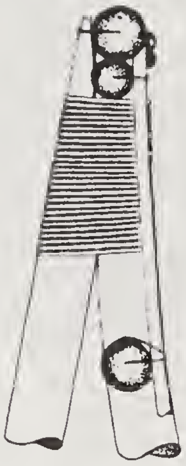

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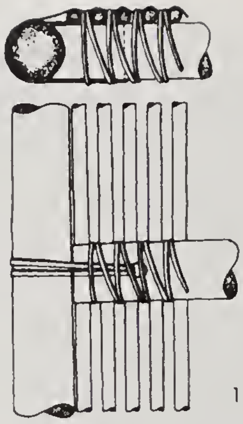

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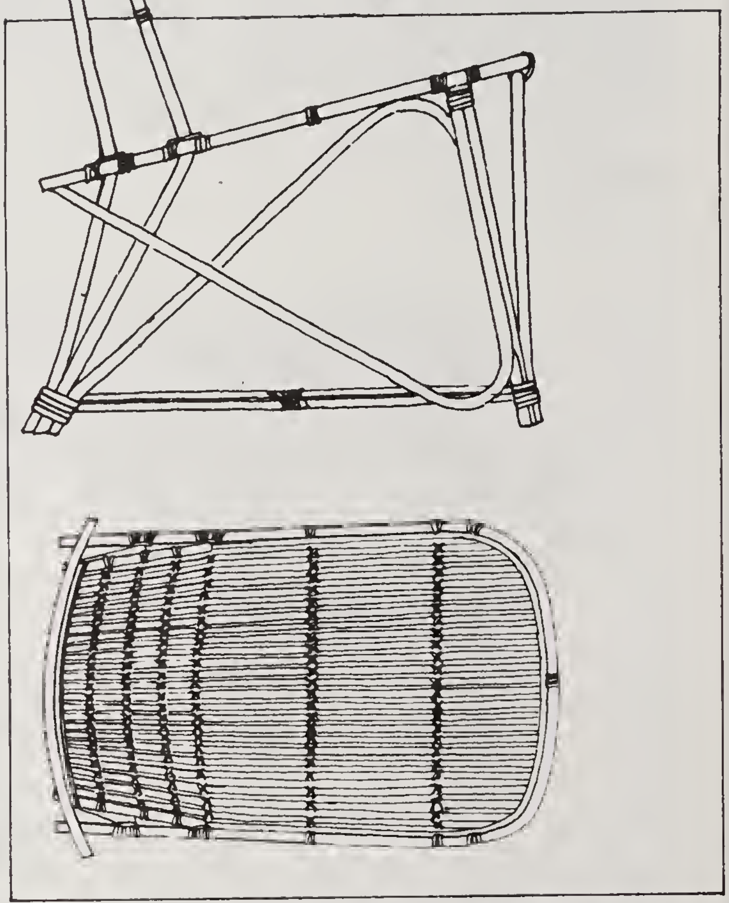

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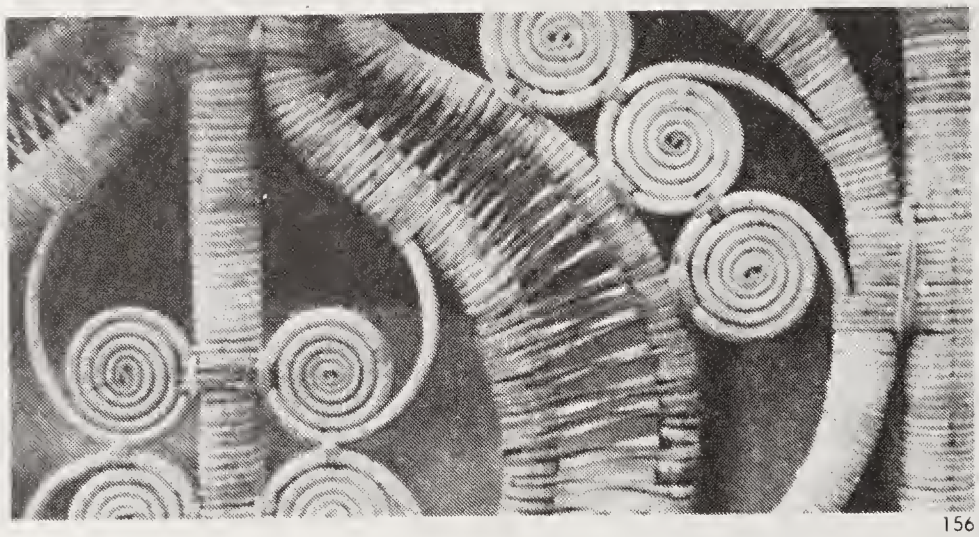

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151: Plan and side elevation of a high-backed cane dining chair.

152: A sectional elevation of the detail at the top of the backrest.

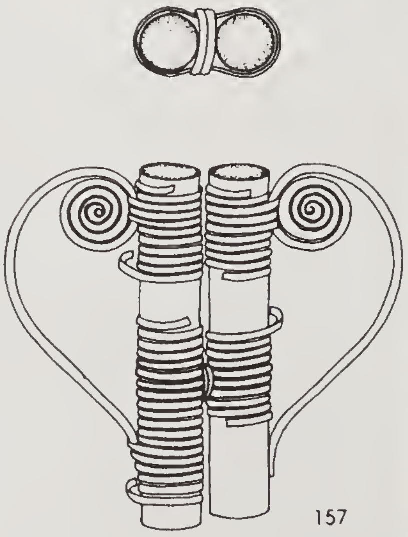
153: The plan and sectional elevation of the backrest construction.

154: "Peacock" chair in cane.

155: An ornate room divider in cane.

156: Coiled cane elements in a detail of the room divider.

157: Detail of the hinge in plan and elevation.



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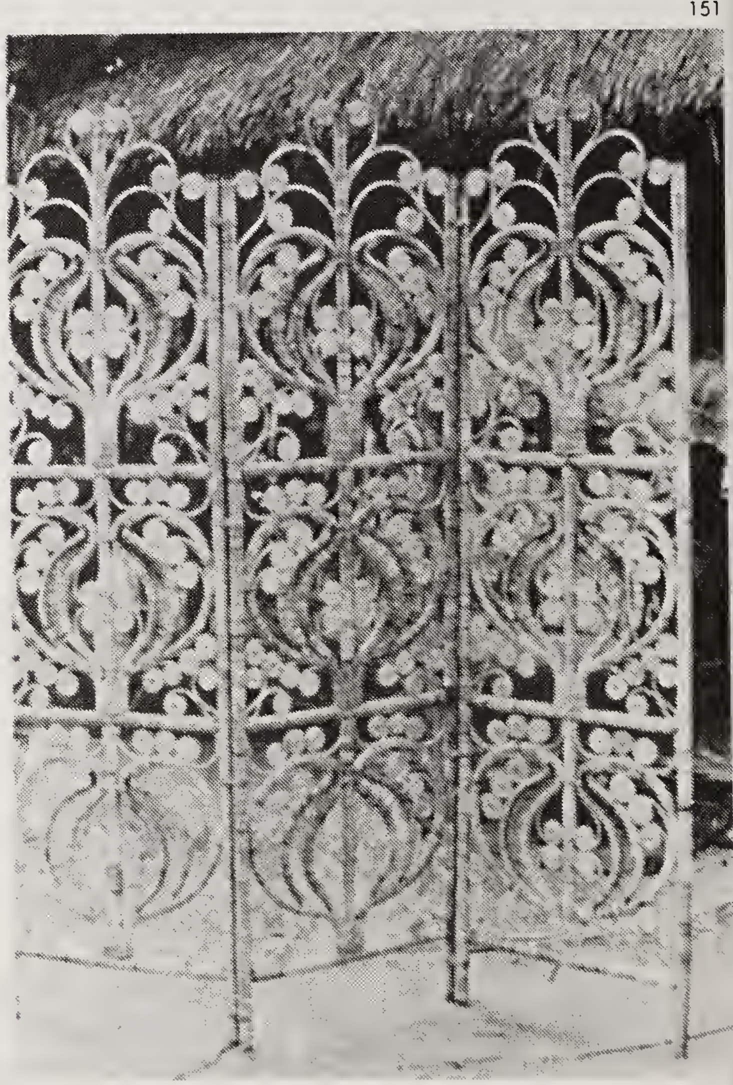

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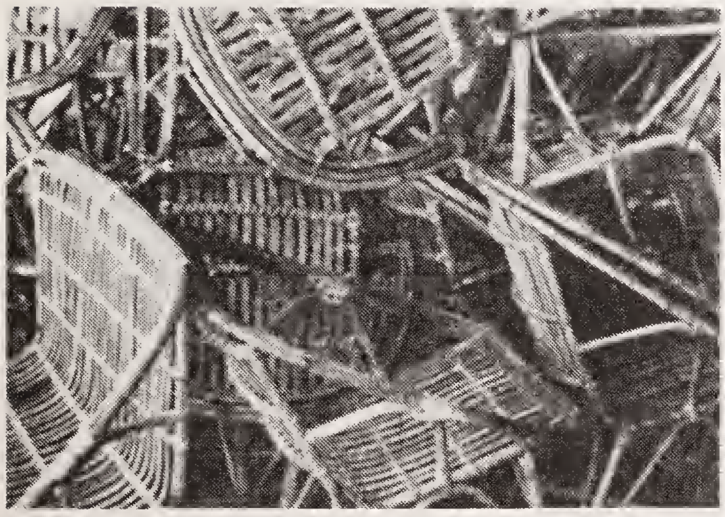

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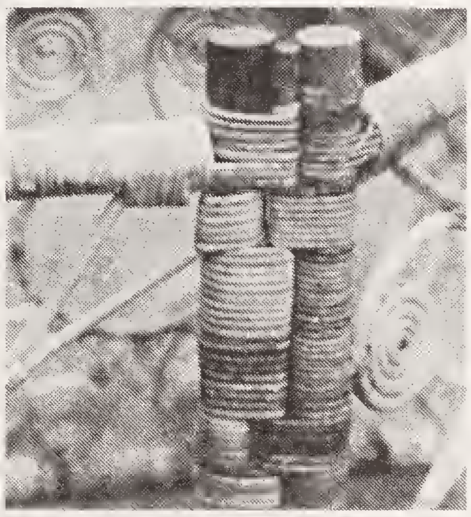

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one centre table and two side tables (figs. 146-150); (3) a small range of cane chairs; (4) high-back and low-back dining chairs (figs. 151-153); (5) highly-decorated "peacock chairs" (fig. 154); (6) screens and room dividers in the form of three decorated panels hinged together by loops of split cane (figs. 155-157); and (7) a small range of cane baskets made by coiling or weaving (figs. 158, 159).

A few manufacturers have developed folding or dismantling construction for beds, tables, etc. (fig. 160) to solve problems of transportation (fig. 161). Without this sort of innovation in construction these manufacturers would be unable to make a competitive bid for upcountry markets.

158: A picnic basket.

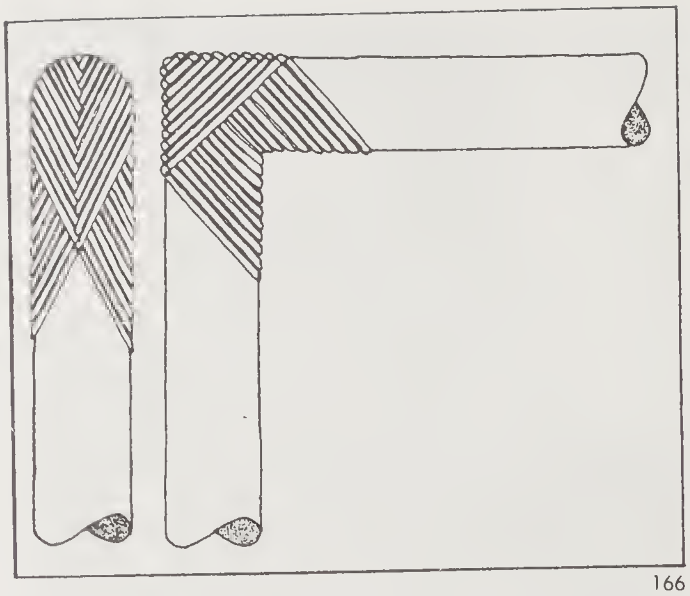
159: An oval picnic basket.

160: Detail of hinge in the folding table.

161: The problem of storage and transport.

Structures

The principle of construction employed in these items of furniture involves the preparation of the basic elements or members by bending lengths of whole cane to the required shape and then fixing these members in position with the use of metal nails. These nailed joints are then tightly bound by lengths of split cane, both to cover the visible nails and to give additional rigidity. The binding detail sometimes has a decorative quality (figs. 162-166). The structural principle predominantly employed to generate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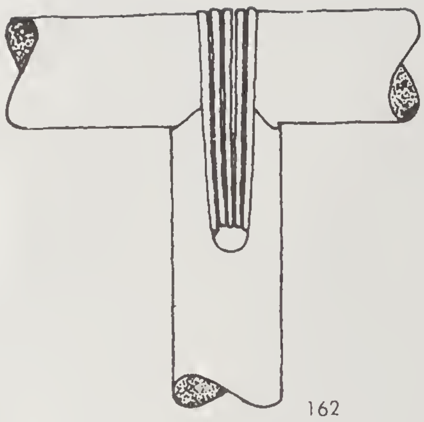
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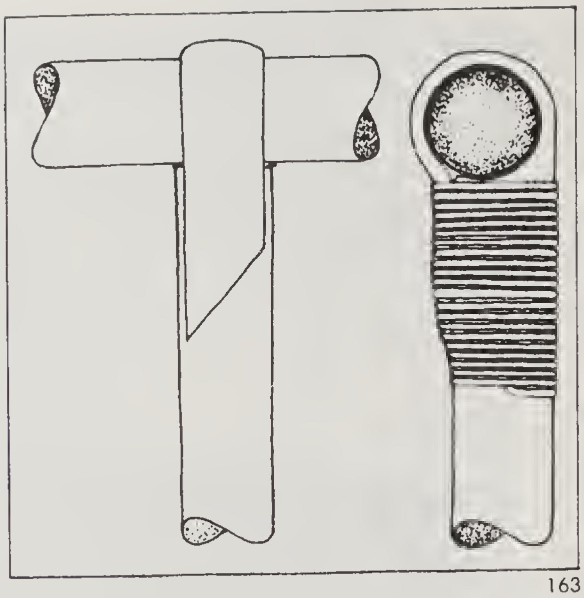
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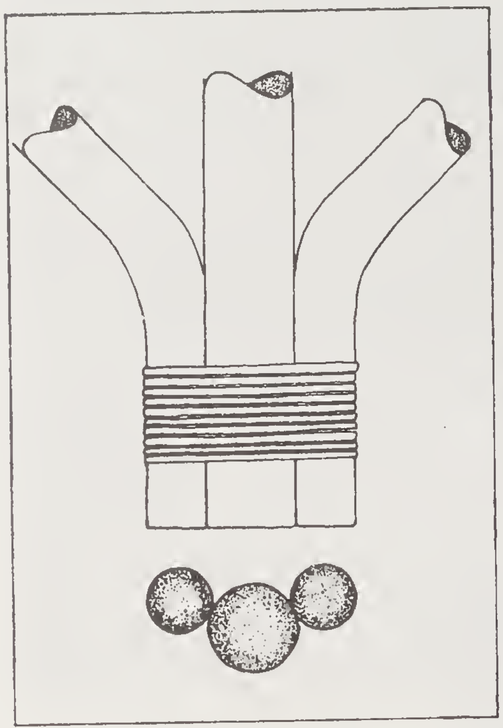
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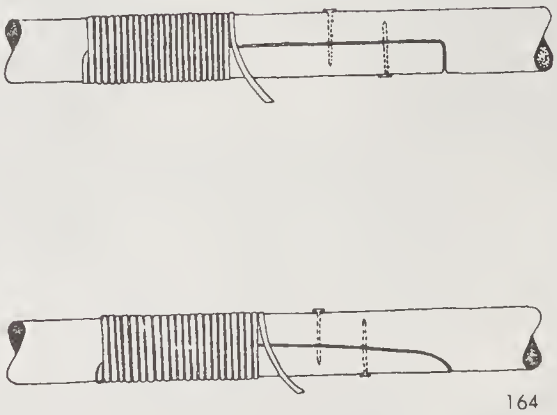
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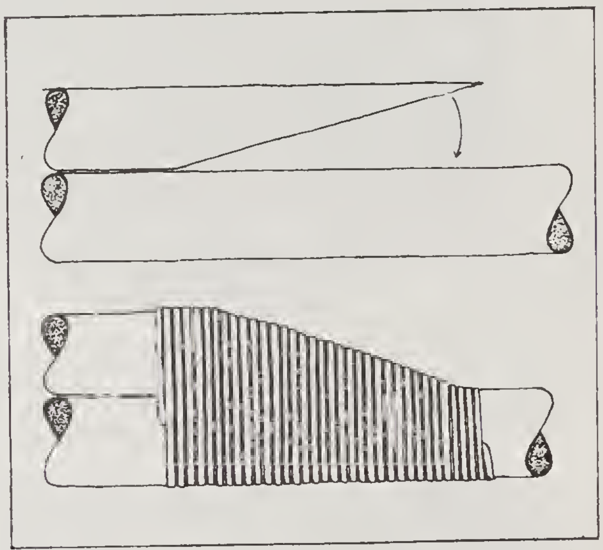
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162: A "T" joint. The upper end of the vertical element is notched to receive the horizontal member. Split cane binding through a pierced hole holds the joint.

163: Another "T" joint where the vertical element is shaped to form a long arm which is then bent over the horizontal member and bound tightly.

164: A nailed and bound joint used to axially extend a whole cane member.

165: Detail used to terminate one of a pair of parallel cane members.

166: A plan and elevation view of the decorative binding used over a nailed mitre joint.

167: The triangulated configuration.

rigid structures is the use of multiple members taken parallel to each other and bound firmly with lengths of split cane. In order to complete the structure, selected members branch out to meet other sets of members to form triangulated configurations (fig. 167). Cane lengths of varying diameters are used together depending on the load requirements of the individual piece of furniture or the part where it is used.

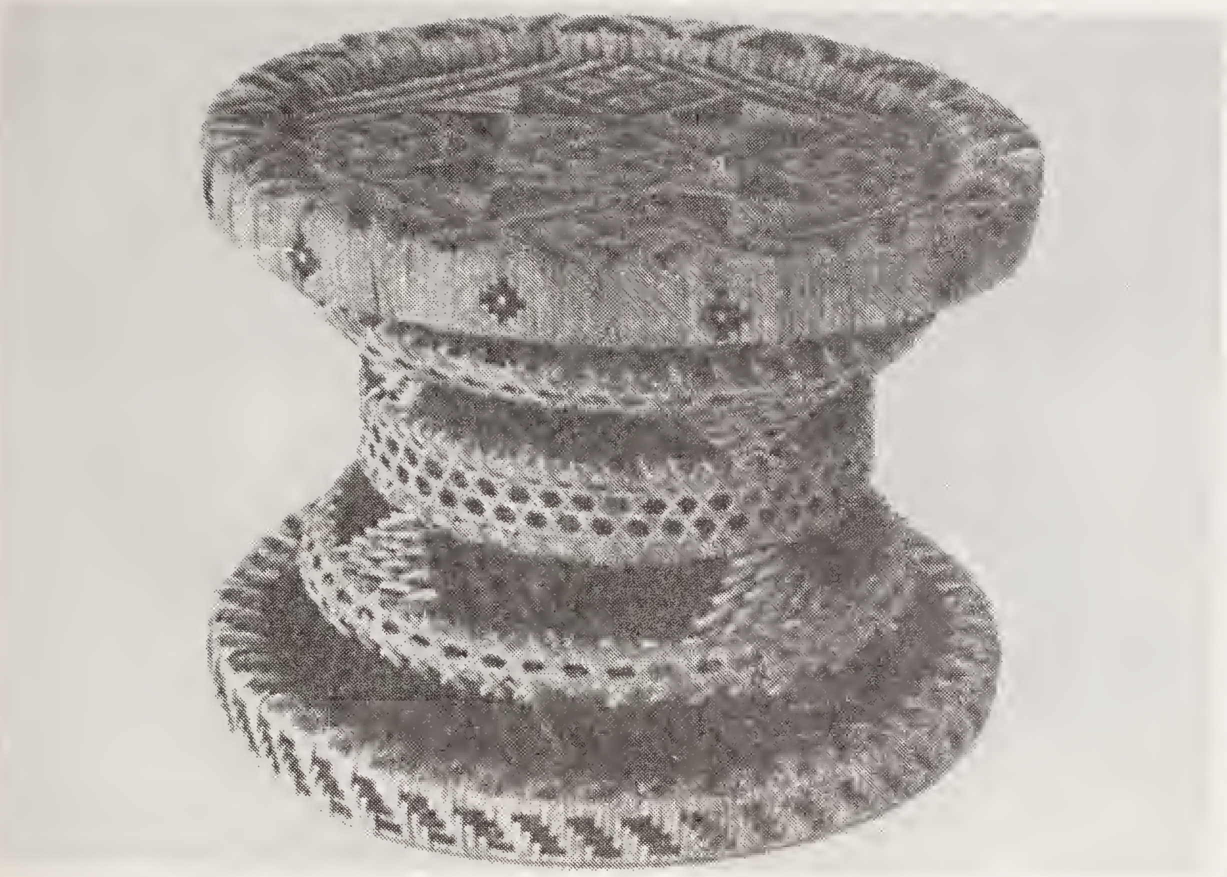
Surface Finish

In order to get a uniform finish on all components the surface layer of individual components is scraped with a sharp blade to expose the light coloured layer immediately below the dark outer skin. This is particularly important where bends have been made with a blow-lamp as the portion exposed to the flame gets charred. However, the lower layer is not affected by this heating process. Items of economical furniture are not scraped as this involves a considerable amount of labour. In some cases clear varnish, lacquer or even enamel paints are applied over the finished product. But mostly the natural surface of the cane is retained without any surface application.

Native Furniture

Mudah from Tripura

The Tripura *mudah* is a low stool made of bamboo and split cane (fig. 168). Bamboo is used in the body and rim structure while split cane is used in binding all elements and in the seat weave. The body of the *mudah* has a structure suitable for the use of relatively thin members to support the dynamic loads. This is achieved through the use of a large number of thin members supporting each other (fig. 169).



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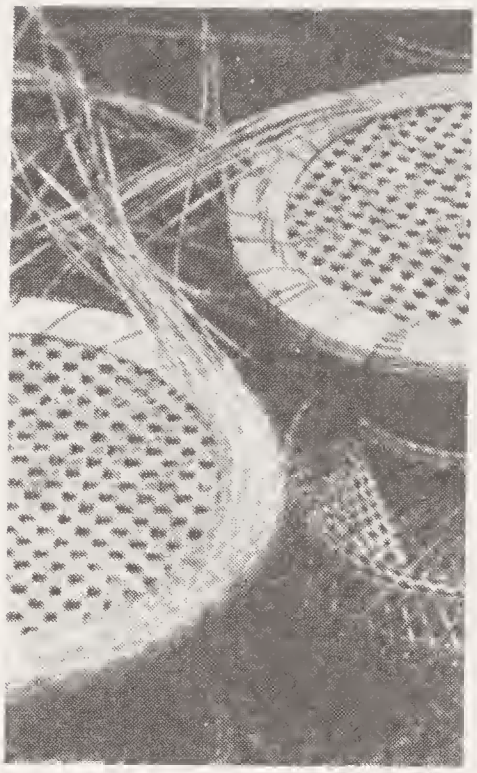

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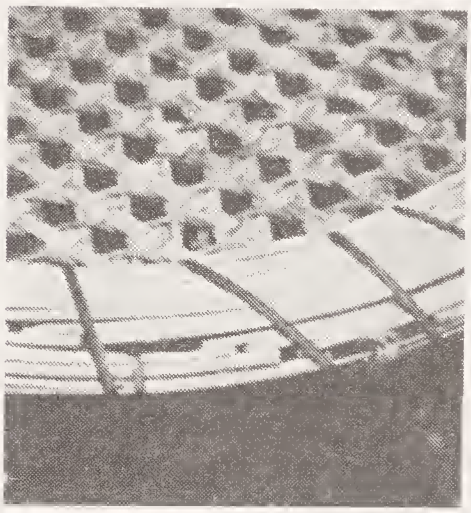

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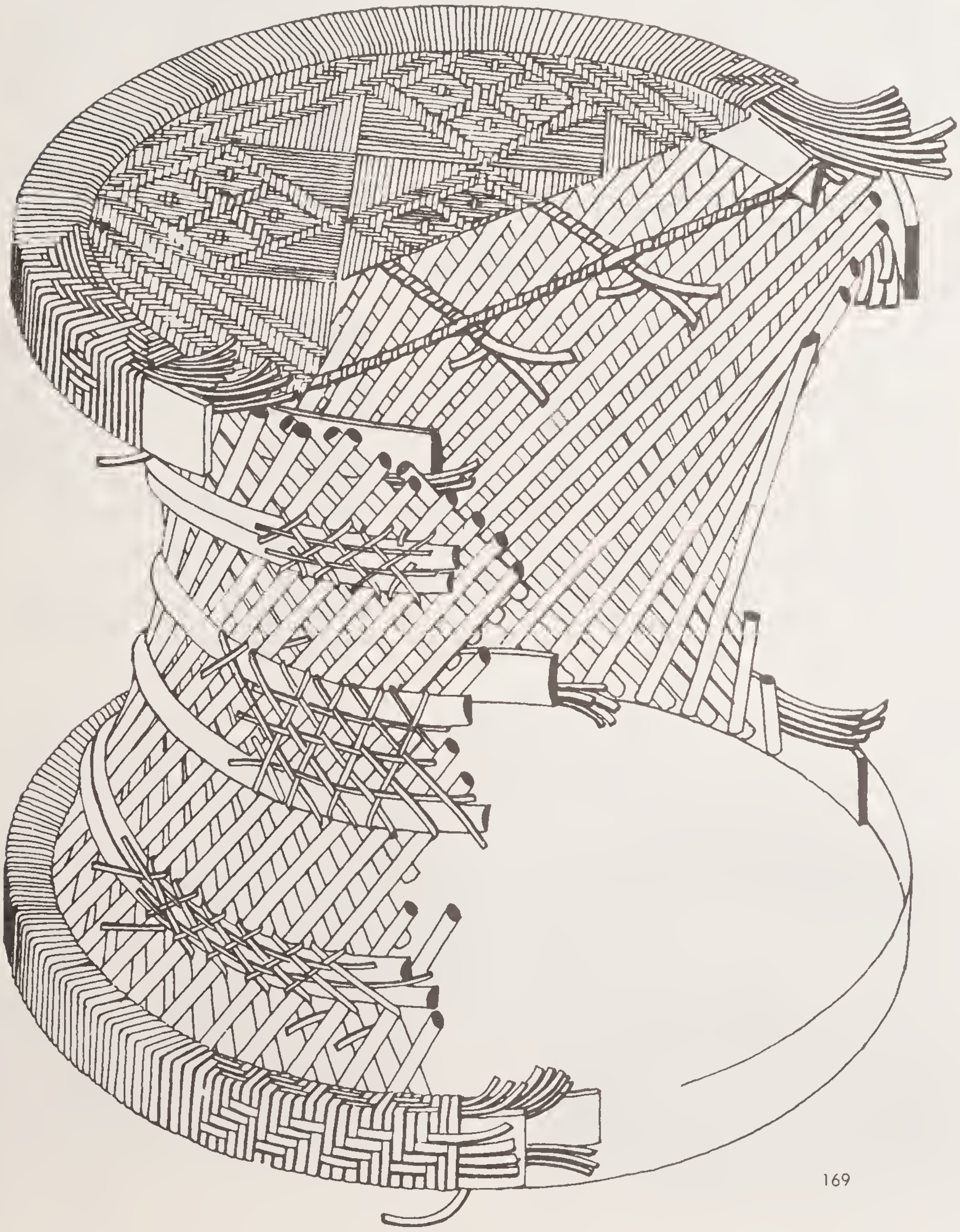

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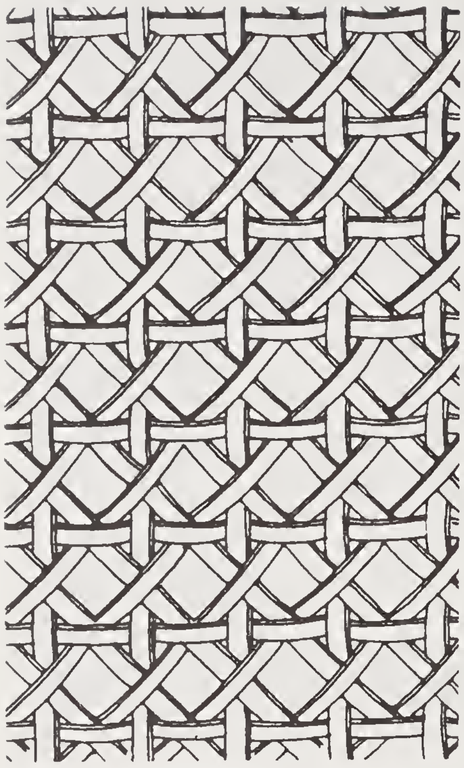
168: The decorative Tripura *mudah*.

169: A cutaway diagram showing the construction of the *mudah*.

170: Semi-finished *mudahs*.

171: Rim binding detail of a semi-finished *mudah*.



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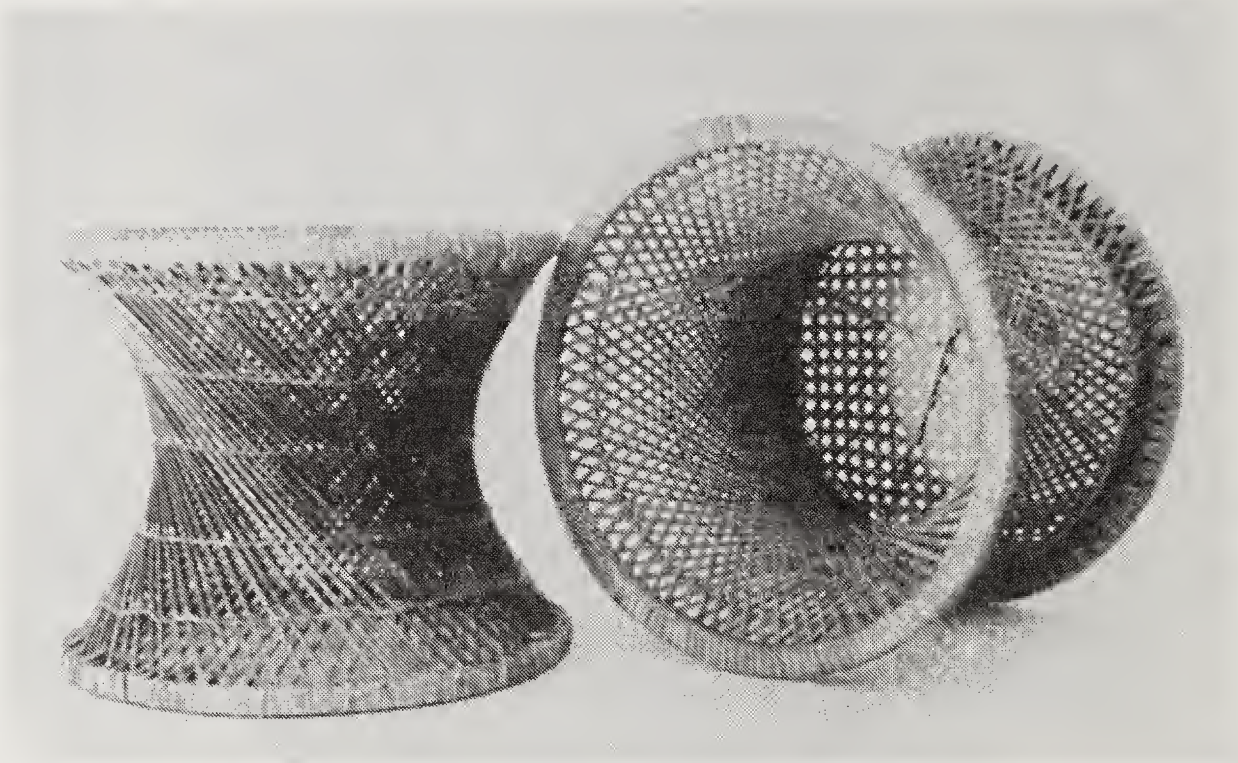

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172: The light *mudahs* from Silchar.

173: The weave structure used in the seat.

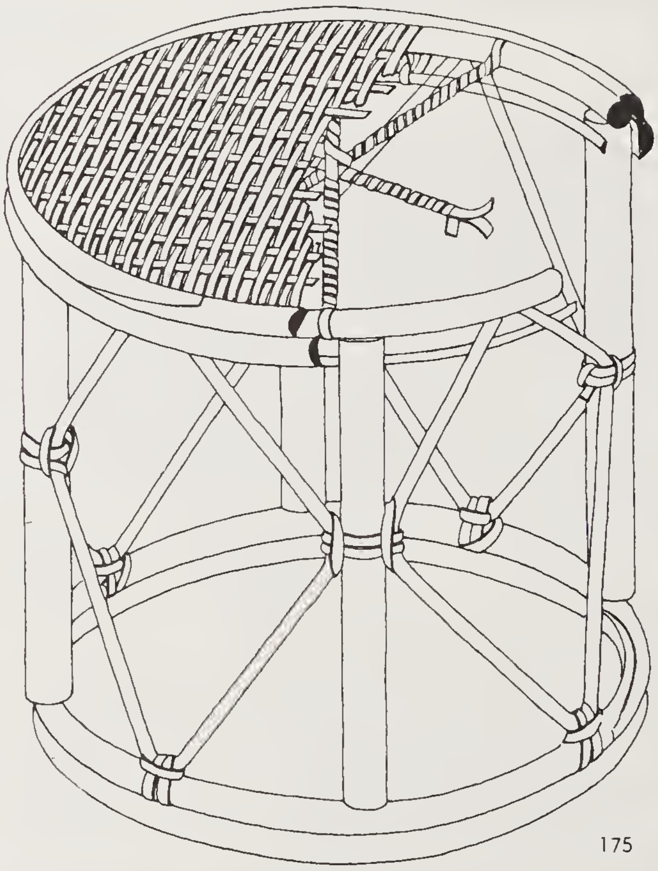
174: The Manipuri *mudah*.

175: A cutaway diagram showing the construction of the *mudah*.

176: Mizo stools made from cane, bamboo and raw hide.

177: Detail of the seat construction.

178: The view from below showing the seat construction and the raw-hide binding.



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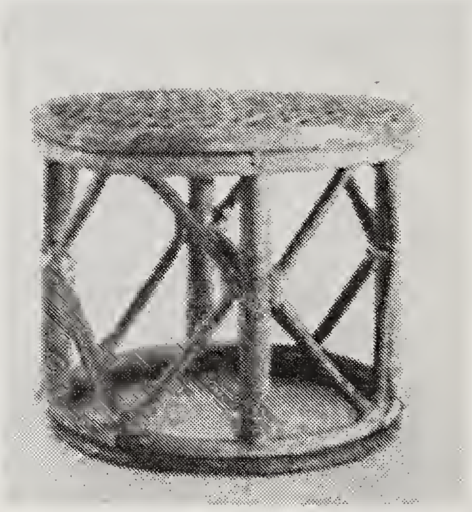

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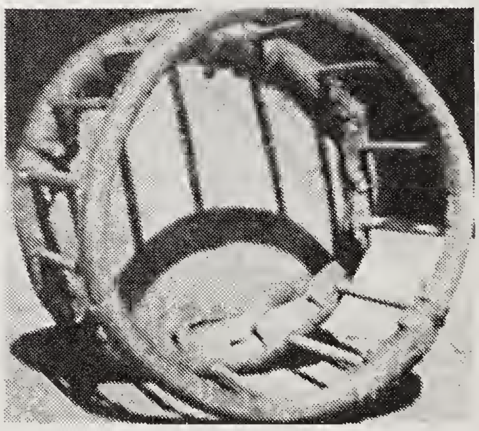

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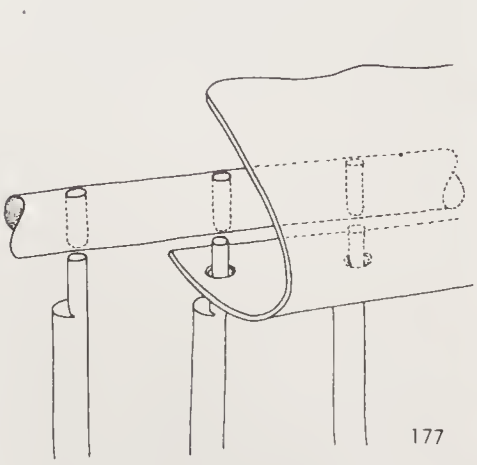

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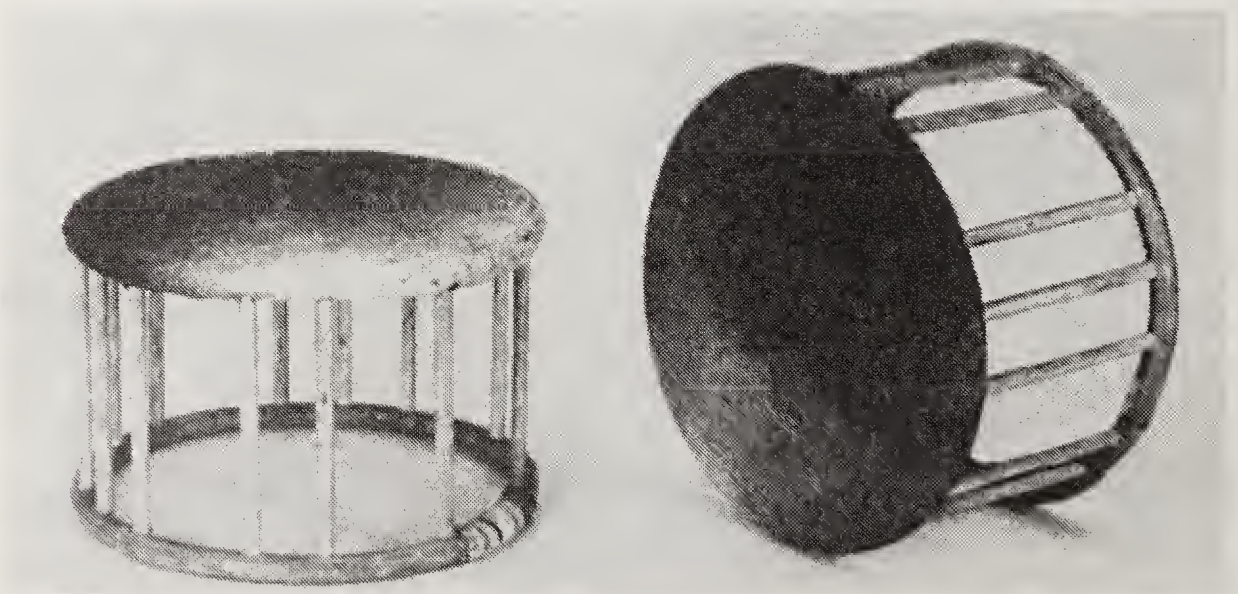

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Structure and Finish

Elaborate binding details give the *mudah* strength of construction, and decorative weaves are used in the seat and the rim covering (fig. 170). The rim is made up of several layers of split bamboo about 30 mm wide, sandwiching the ends of the body elements (fig. 171). Tension elements of twisted cane splits are anchored to the seat rim. These pass below the seat weave in order to transfer load to the rim without straining the seat weave. In some cases selected body elements are painted black with enamel paint before assembly while the split-cane bindings are of a natural colour. Similarly in the seat weave selected elements are painted black so that the weave patterns are clearly visible.

Mudah from Silchar

The *mudahs* found in Silchar are simpler versions of the Tripura *mudah* (fig. 172). These are functional and lightweight, as fairly thin bamboo splits are used in the body. Rings made of bamboo are used to strengthen the rims at the seat and base. A simple functional weave is used for the seat and rim cover (fig. 173). Here two tension members are located under the seat weave to transfer load to the rim. These *mudahs* are smoked over a fireplace, giving the surface of both bamboo and cane a rich brown colour.

Mudah from Manipur

The Manipuri working *mudah* is an all-cane structure cylindrical in shape (fig. 174). This forms a small, low seat for everyday use in Manipuri houses, and it is light and portable. The structure is formed by a series of cane rings supported on four vertical posts of whole cane which have been strengthened by cross braces (fig. 175). The structural members are secured by metal nails and then bound firmly together by lengths of split cane. The seat is of woven cane splits anchored to one of the upper rings and tension elements are located below the seat surface to transfer load away. Additional cane rings are provided below the lower structural ring to protect the cane bindings from possible rupture through friction with the floor.

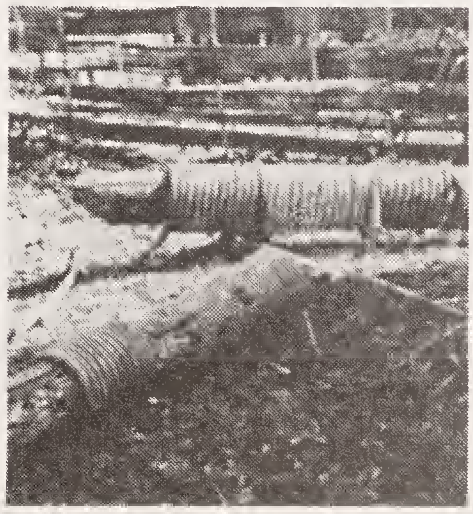
Stool from Mizoram

The Mizo stool is a short cylinder made of two rings of cane held apart by a series of vertical bamboo splints located around the circumference of the rings (fig. 176). These splints have both ends shaped to form tenons, which are firmly driven into corresponding holes provided in both rings. The seat surface is made of raw hide stretched tight over the upper ring and simultaneously held in place by the bamboo verticals (fig. 177). The cane rings are held in shape by overlapping the free ends by an inclined cut which is then bound by leather thongs (fig. 178). The local names of the cane and bamboo are *mitperh* and *phulrua* respectively.

Bending of Cane (Solar Energy)

The most interesting feature of the Mizo stool is the manner in which the rings are formed. Usually, in the making of cane furniture, heat from a blow-lamp is applied to the cane in order to bend it into the desired shape. The Mizo craftsmen have discovered an unique way of bending cane. As freshly-harvested cane is fairly flexible, a length of cane is wound around a cylindrical wooden post of selected diameter into a tight helix and left to cure in the sun (fig. 179). The cane is left in the sun for three or four days before being removed from the mould and cut to form rings of the required size. This concept of the use of solar energy to form cane components is interesting as it could find application in other cane harvesting centres through a transfer of technology.

179: Fresh cane wound around a wooden post and cured in the sun.



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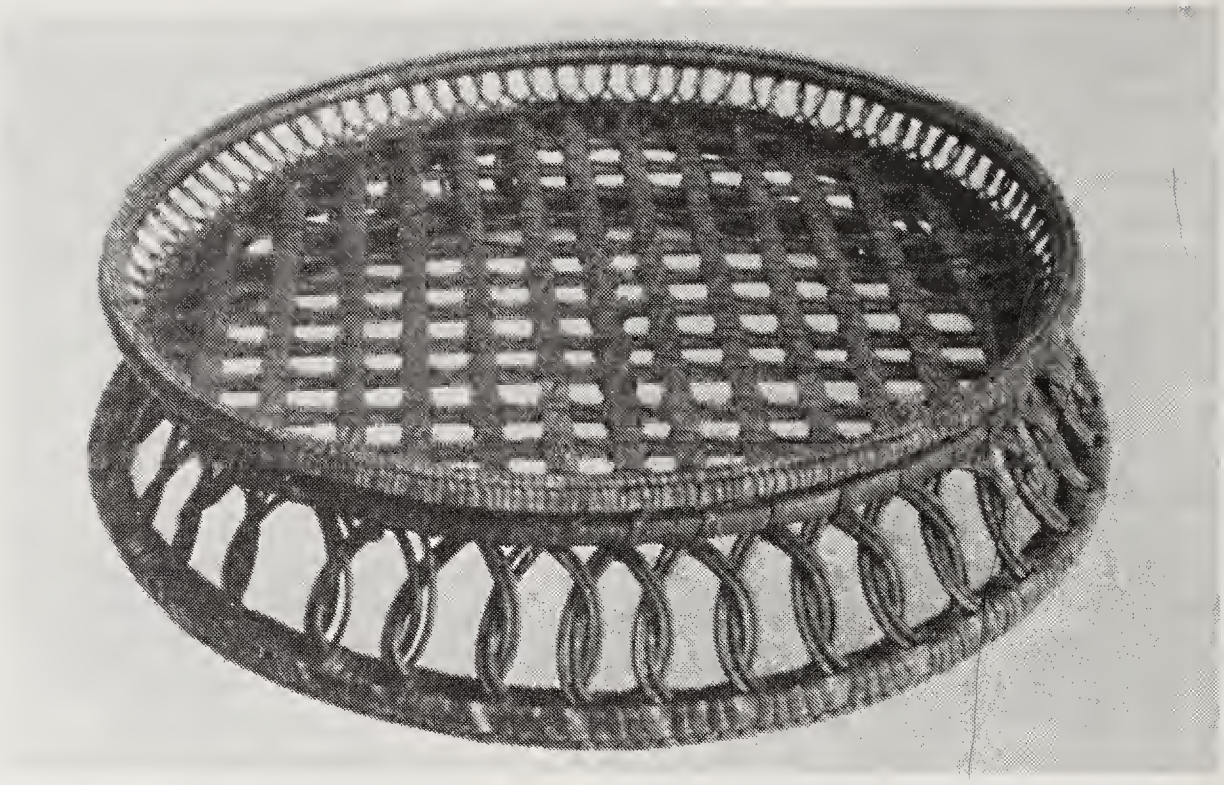
180: The *leephang*.

181: Cutaway diagram showing the construction of the *leephang*.



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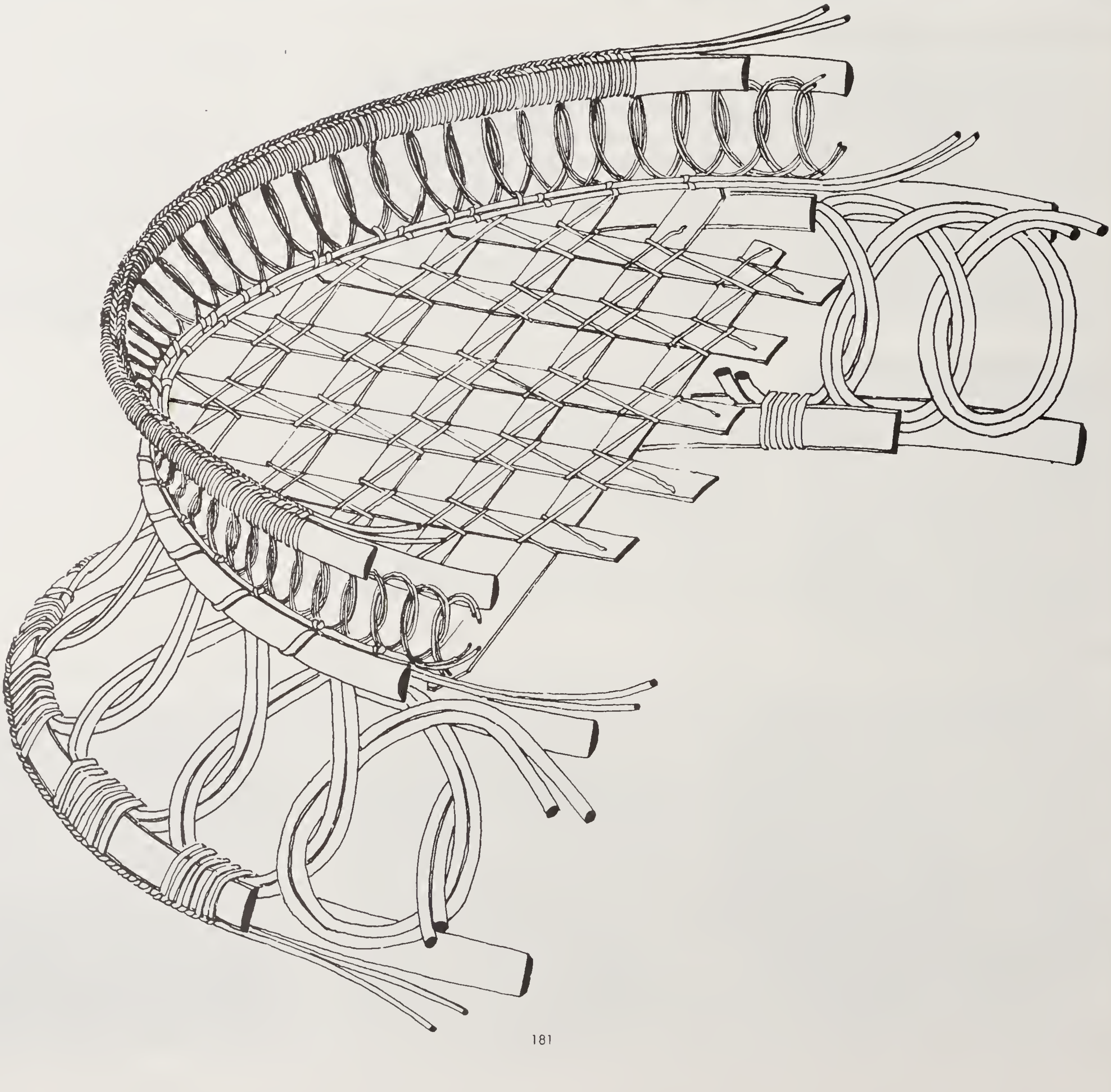

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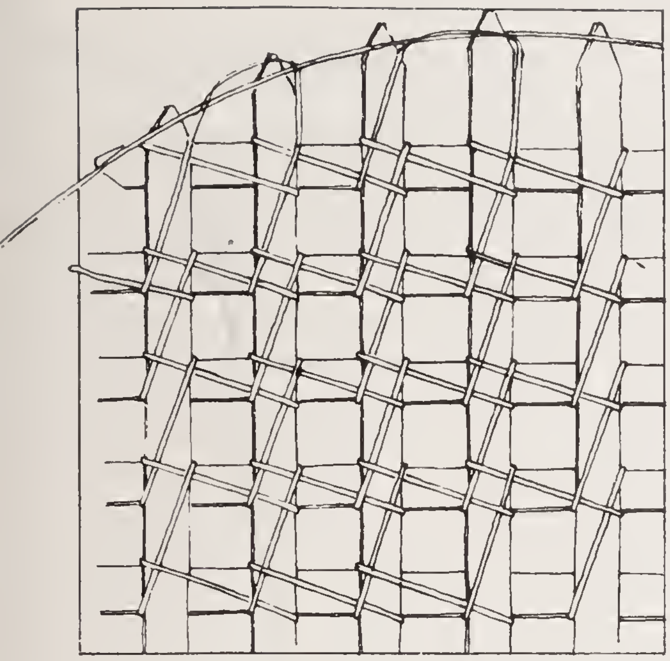

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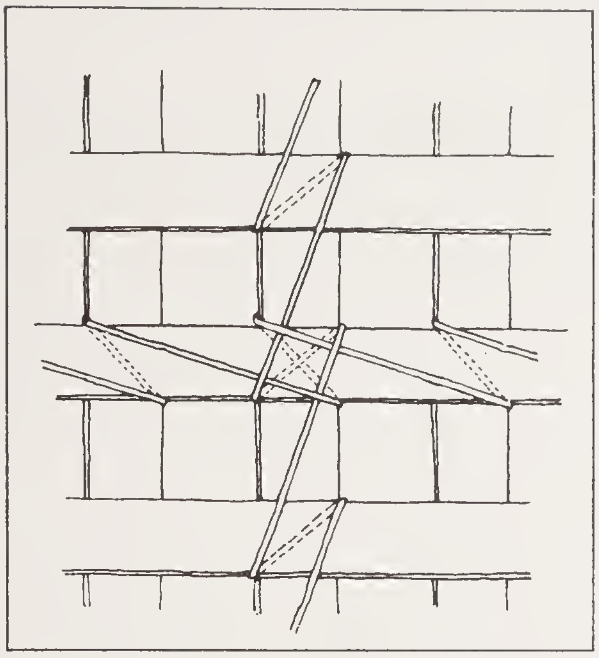

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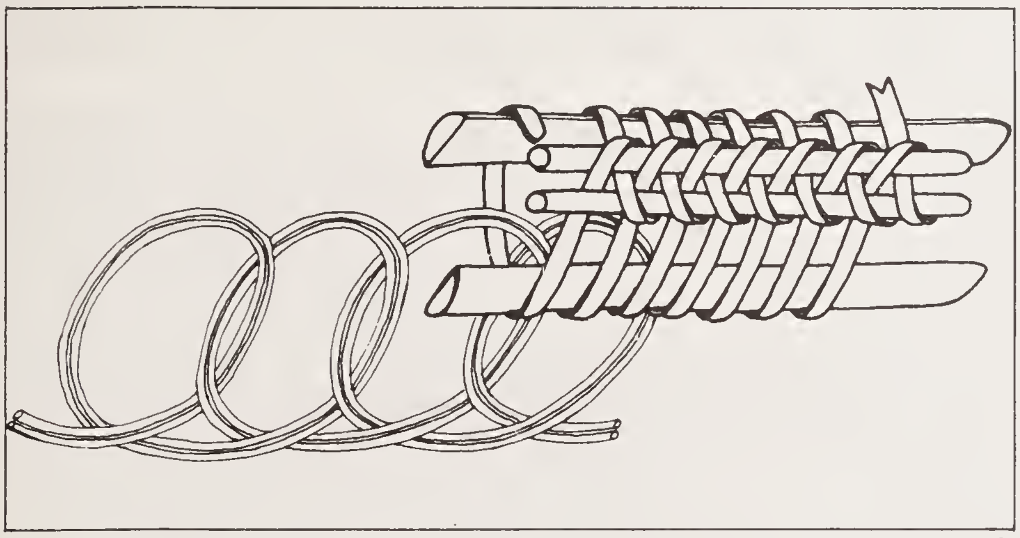
182: A plan detail of the table top.

183: The binding construction of the table top.

184: Exploded view of the construction of the border.

185: The binding construction for the rim.



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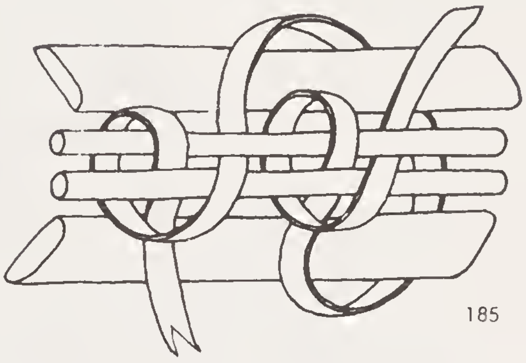


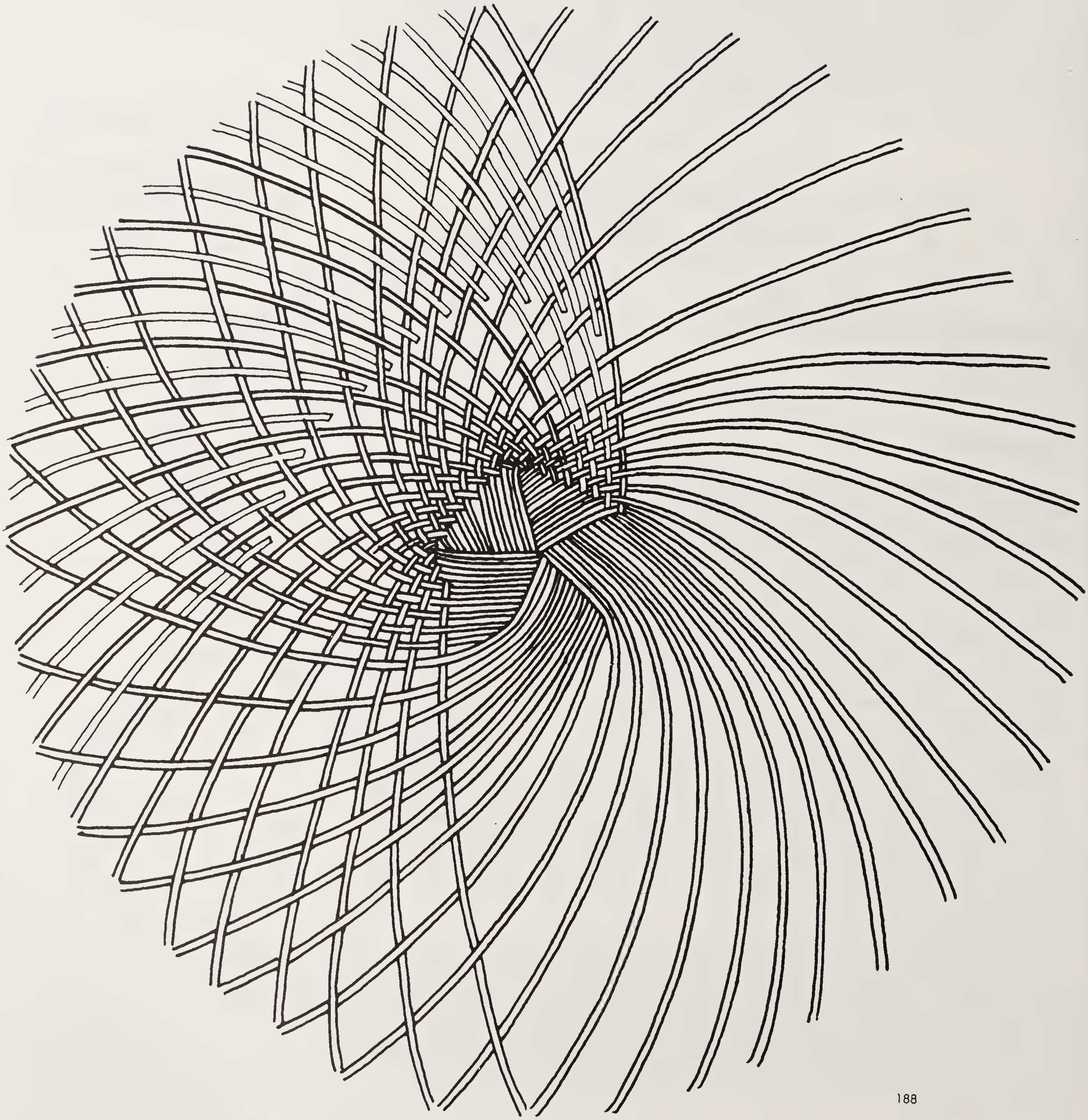
185

Leephang

The *leephang* (Manipuri dining table) is a good example of product fabrication (figs. 180, 181). It forms a low platform which can support wooden plates, and people sit around the table on the floor. It is made and used by the Maring hill tribe of eastern Manipur. The table is made in several sizes and shapes varying from circular or elliptical to square with large corner radii. It is an interesting combination of bamboo splits, whole cane and split-cane binding. Its surface is made of wide splits of bamboo, arranged in an open square grid, formed by two layers of splits spaced apart, with the upper layer oriented at right angles to the lower layer (figs. 182, 183). Both layers are bound by sets of thin cane splits moving in both directions. Around the perimeter of the round table surface are placed two rings, one above and one below. They are both made of looped whole cane elements moving in a double cycloid pattern such that the upper and lower edges of the rings are of a larger diameter than the table itself. These edges are covered with rings made of bamboo splits and bound with split cane to form a decorative border (figs. 184, 185). The upper ring which moves around the top of the table is shorter in height than the bottom ring which forms the base of the table.

Vegetable Dye

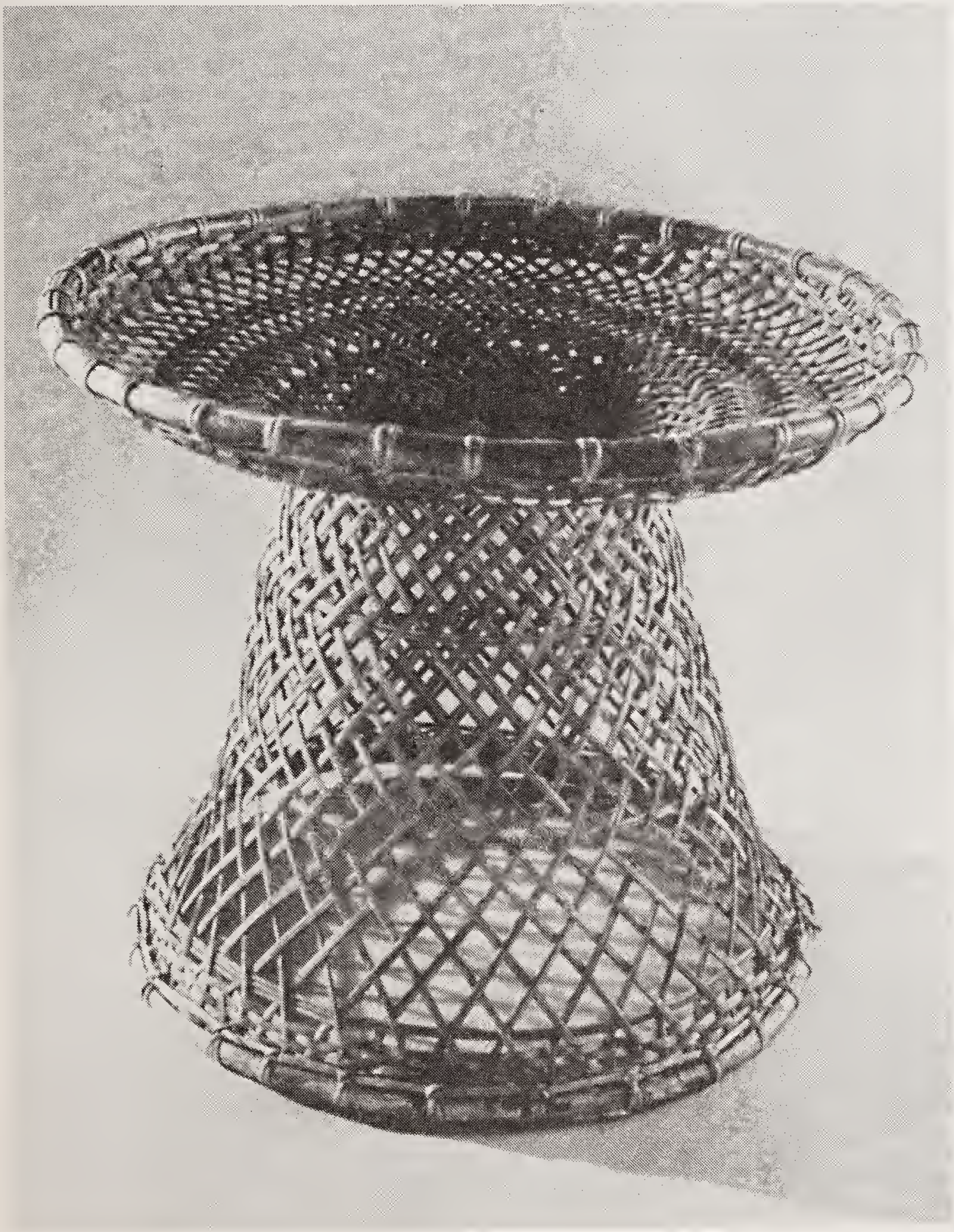
All members are dyed a deep brown colour using a locally available vegetable dye. The bark of a tree locally known as *shaikui* is used for dyeing the cane and bamboo components. The finished product is subsequently smoked and the colour is intensified thereby. The cane used in this construction is locally called *lejai.* The structure is extremely sturdy, and has a decorative form which is unselfconscious and based on an elegant structural logic.



188

Wancho Dining Table

This is a small structure woven from split cane and used to support one wooden plate or bowl. The table can be divided into two basic parts, namely the circular tray-like table surface and the conical supporting tube (figs. 186, 187). The diameter of the table surface is 350 mm and the height is about 300 mm. The weave of the table surface is formed by five sets of elements spiraling outwards from the centre in both clockwise and anti-clockwise directions (fig. 188). Additional splits are woven into this structure forming consecutive circles which lock the interlaced spirals in place. The supporting tube is an integral part of the table surface as the interlacing elements of the tube surface turn into the horizontal plane to intermesh with the weave of the table surface. The outer rims of the table surface and the lower edge of the supporting tube are strengthened by sandwiching the open edges between two half cane splits which are bound tightly together by split-cane binding. The supporting tube also has concentric rings woven into the structure to prevent distortion. The structure of the table is extremely strong and rigid though it is almost entirely made of fine cane splits except for the rim-strengthening elements.



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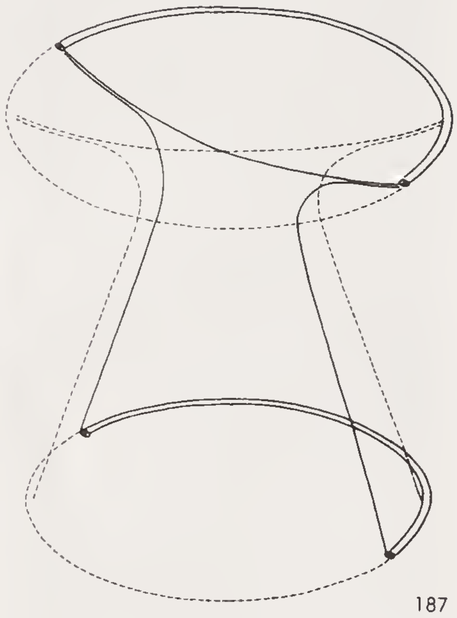


187

186: The Wancho dining table.

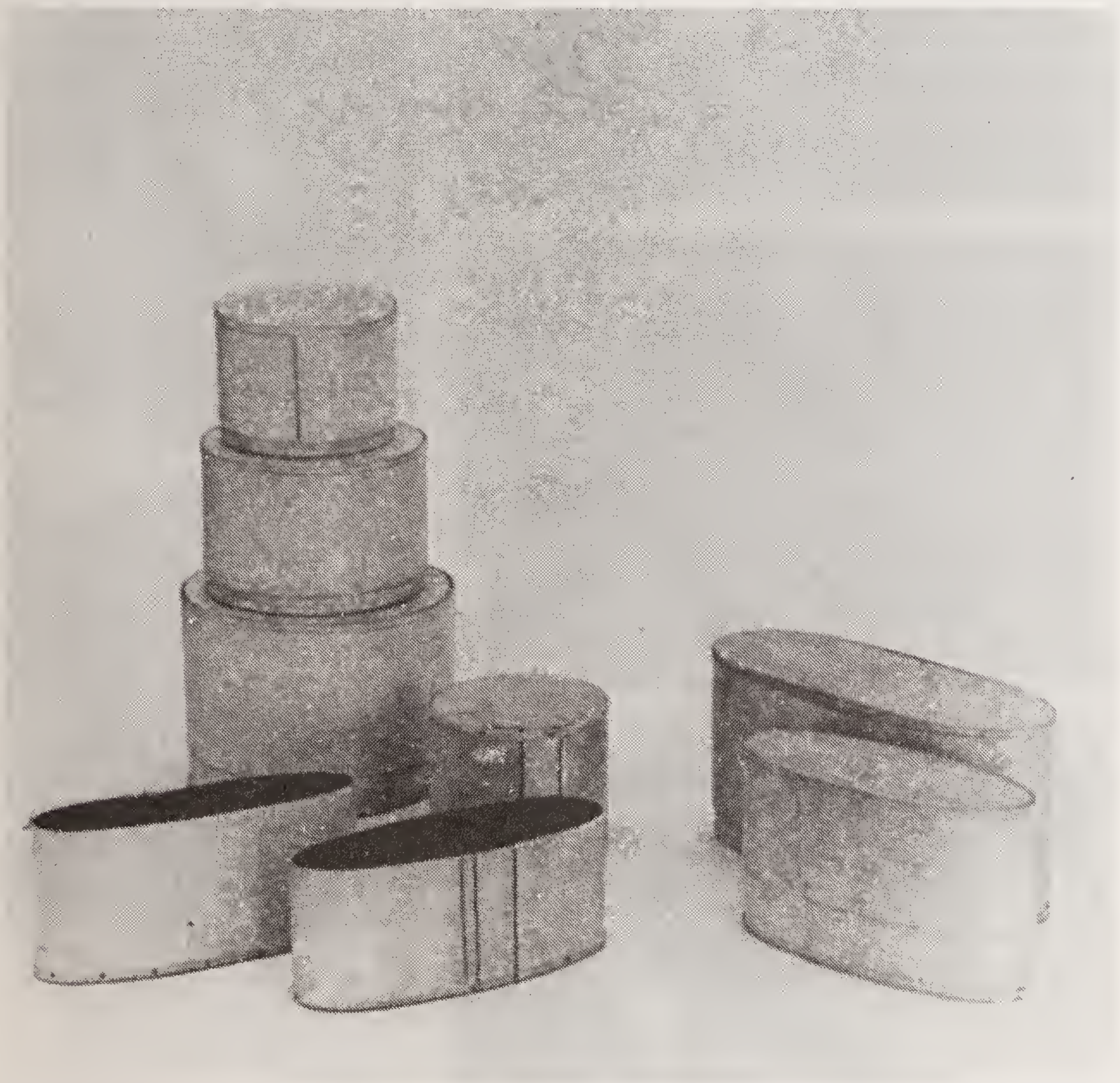
187: A sectional view of the table showing the formal integration of the base and the top.

188: A schematic plan showing the spiralling elements. A part of the drawing includes the elements emanating from the base.

Bamboo Containers

Flattened Bamboo Containers

A very interesting and unusual way of using whole or half bamboo culms to make containers was first seen in Manipur and later again in Arunachal Pradesh and Nagaland. Heat is used to flatten a bamboo culm into a sheet without letting it develop any cracks. These sheets are then converted into containers of different shapes and sizes depending on their function. While the basic process of heat-flattening the culm is the same in all three states, the details of the process differ.



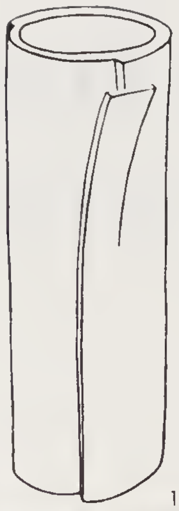
189

189: A collection of *pongsang lephak*.

Pongsang Lephak

The most elaborate method is followed in Khoibu village in Tengnoupal, a hill district of Manipur. The boxes called *pongsang lephak* are made from heat-flattened culms (figs. 189, 190-195).

The *sondak* bamboo, known as *natt* in Imphal Valley, is a thin walled bamboo with a diameter of about 60 mm and an internode length of about 900 mm. Only the internodes are used (fig. 196).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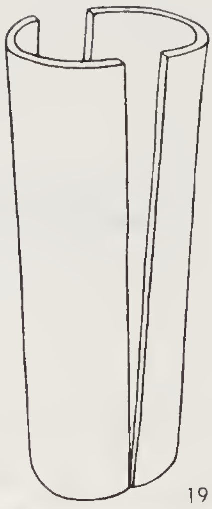
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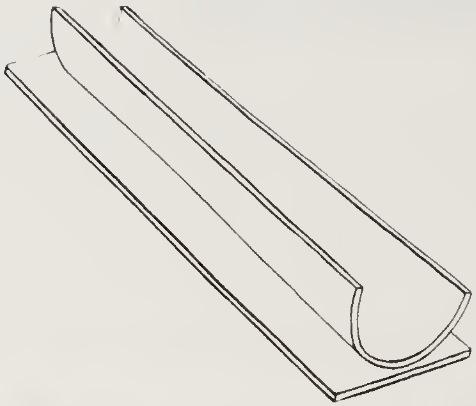
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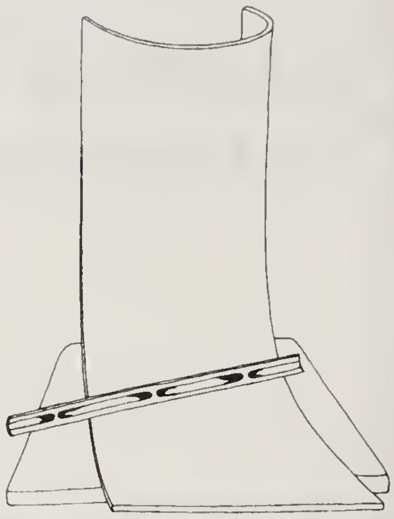
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197

190: The wall thickness of a bamboo internode is reduced by removing the outer skin.

191: The internode is split in halves.

192: Each half is heated over a fire before it is flattened into a board.

193: The curve of the culm is flattened by deforming the convex surface.

194: The heated board is bent into the desired shape, and the overlapped ends are held in a simple bamboo clamp.

195: The overlapped ends are stitched with thread before the base is fixed.

196: The culm is cut into internodes.

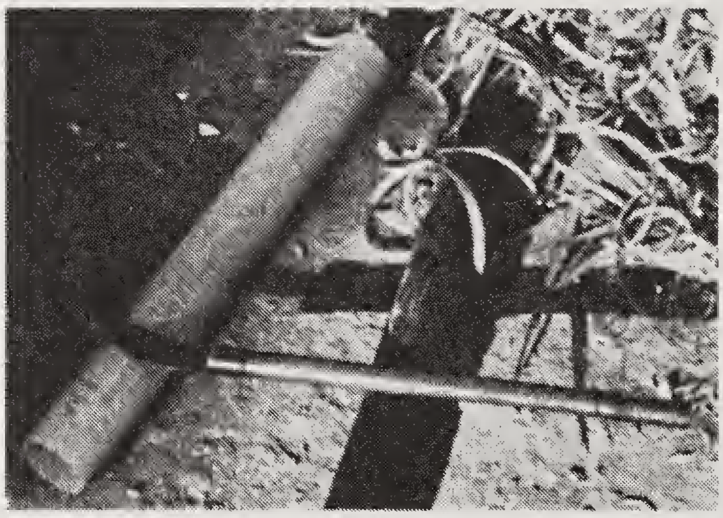
197: The outer skin is removed.

198: The wall thickness is made uniform.

199: A *dao* with a long wooden handle is used by the Khoibu craftsman.

200: A single slit is made when a wider board is required.

198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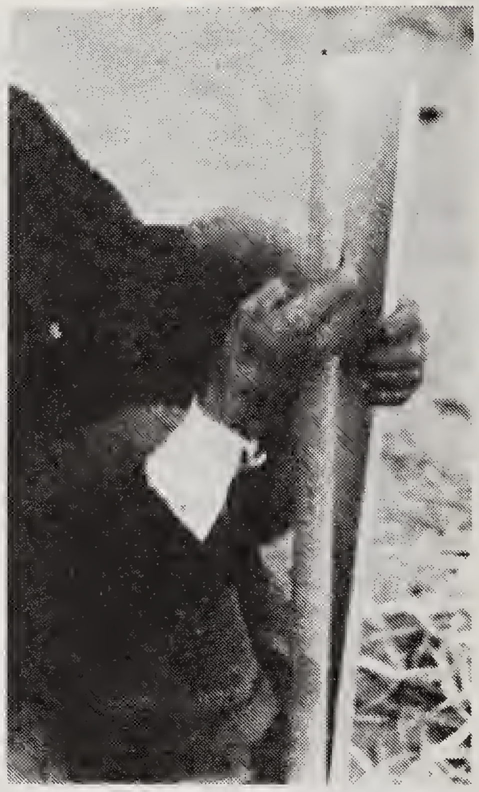
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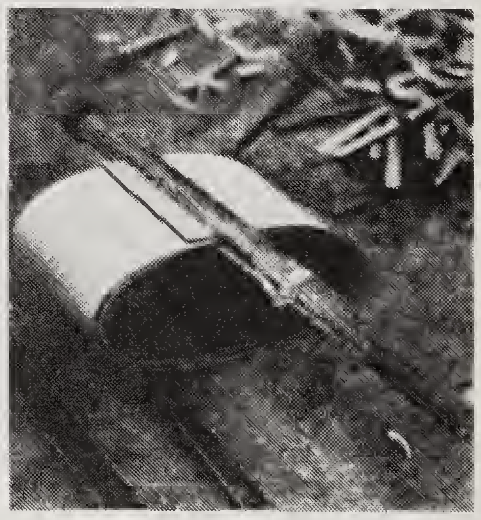
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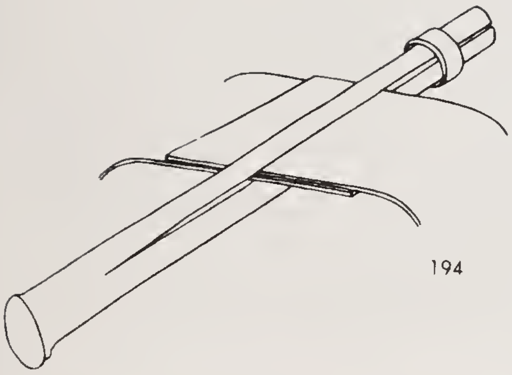
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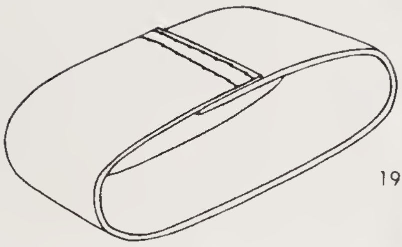
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196

201

203

201: *Kharu*, a toxic resin, is used in the process.

202: The culm is heated over a fire.

203: The culm is flattened out.

204: A bamboo clamp is used to hold the ends. The board used for the lid is bent over the container to ensure a good fit.

A section of the internode of a freshly-cut bamboo is peeled to a wall thickness of 1 to 1.5 mm (figs. 197-199, 190) and split along its length (figs. 200, 191). A toxic resin, *kharu*, is collected in small bamboo tubes which are inserted into the trunk of the *kabong* tree (fig. 201). A little of the resin is then mixed with water and applied on both surfaces of each section of bamboo. According to the Khoibu craftsmen, this resin prevents the bamboo from developing cracks while it is being heated, but the chemical effect of the resin is not clear. The bamboo is then held over a small fire and heated evenly along the length (fig. 202). This causes it to become very pliable and the circumference slowly opens out (fig. 192). A stick is used to press the bamboo flat on the ground (figs. 203, 193). The width of the sheet thus formed is half the circumference of the culm. It is also possible to make a sheet with a width equal to the entire circumference of the culm if, instead of splitting the culm in half, only one slit is made in the culm wall.

While the sheet is still hot it is formed into the desired shape. Traditionally, oval boxes were made this way. The length of sheet is bent and the ends overlapped to form the side walls of an oval box. This is done so that the inside surface of the internode forms the outside surface of the box. The joint is held in a split-bamboo clamp, a very simple device made from a length of thick bamboo splint which is partially split in half along its length (figs. 204, 194). The joint is held between the two splits, the ends of which are held together by a rubber band. The other half of the culm is heat flattened, wrapped around the oval and held in shape. This becomes the lid that matches the box. The overlapped ends are held together by two rows of stitches made with cotton thread (fig. 195). The container and the lid are arranged so that the overlapping joints on each are on opposite sides of the box.

A piece of heat-flattened bamboo, a flat piece of wood or a tangential slice of a thick-walled bamboo culm, depending on the required size, is cut to fit into each oval to form the base of the container and the top of the lid. A narrow bamboo split is wrapped around the edge of the container at the base and nailed to hold the base in place. The lid is finished in a similar manner.

Traditionally these oval boxes had stitched and nailed joints. With the advent of Fevicol, the same boxes are now made by sticking the joints with the adhesive. Round boxes are also made in a similar manner. The round and oval boxes are sold commercially in sets of three sizes, one nesting inside the other.

The Khoibu craftsman asserts that only this particular bamboo can be heat-flattened, that peeling off the tough outer skin is essential, that the resin is essential and that the nodal portion cannot be flattened. The size of bamboo sheet is thus limited to the circumference of the culm of the *sondak* bamboo and the length of internodes.

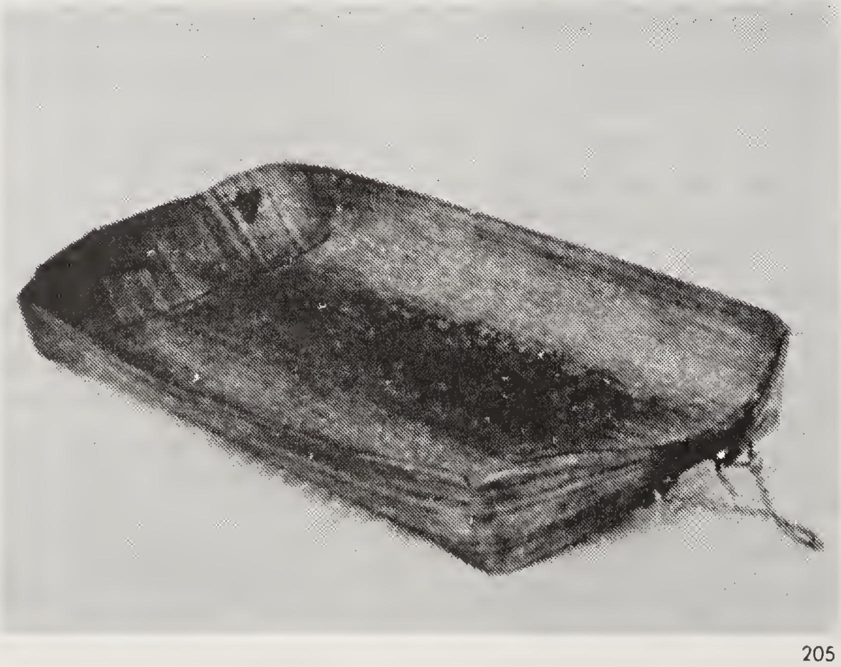
Chang Naga Containers

The Chang Nagas also have a process of heat-flattening bamboo. This was described by a Chang craftsman from the All India Handicraft Board's (AIHB) training centre in Tuensang. The Changs use the *talon* bamboo, which must be harvested in December or January, before the top of the culm begins to droop downwards. This means that approximately seven-month-old culms are used. A length of internode of freshly-cut bamboo is peeled and the ends plugged with leaves and grass. The bamboo is evenly heated over a fire till it begins to swell out in the centre due to the expansion of the trapped hot air in the tube. At this point the internode is slit along the length, and a stick used to press the pliable bamboo into a flat sheet.

Dao cases, small boxes, rice plates and large drums are made from the heat-flattened bamboo board, and all the forming is done while the sheet is hot and pliable. Shallow rectangular trays made by this process are used as rice plates. They are made by cutting and folding the sheets to form the sides of the tray. The folded ends are held in place with cane stitches.

205: The *yaye-paku*, an Apa Tani rice dish from the museum at Hopoli.

206: The *yaye-paku* viewed upside down. A split cane strip holds the folded flaps together.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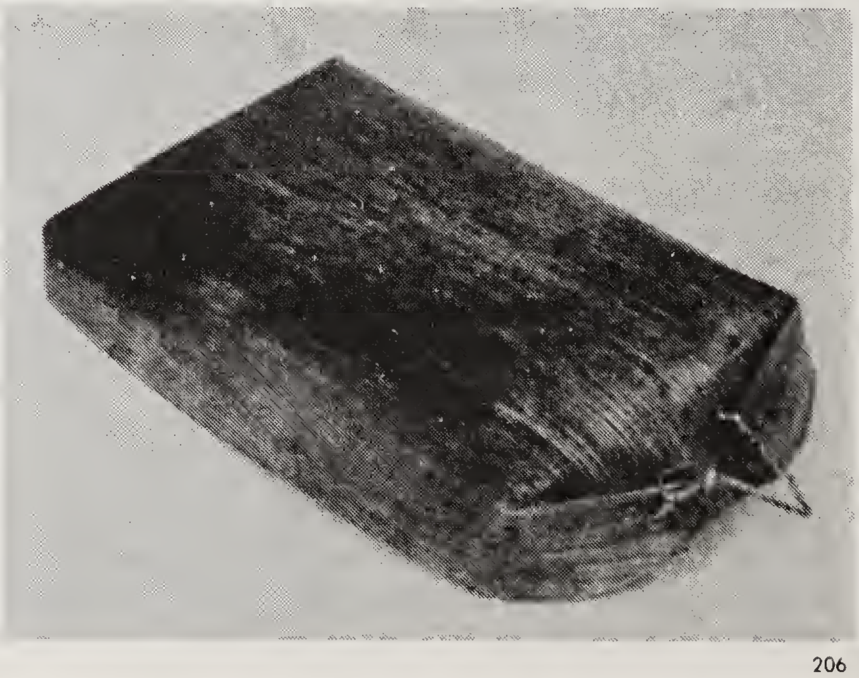
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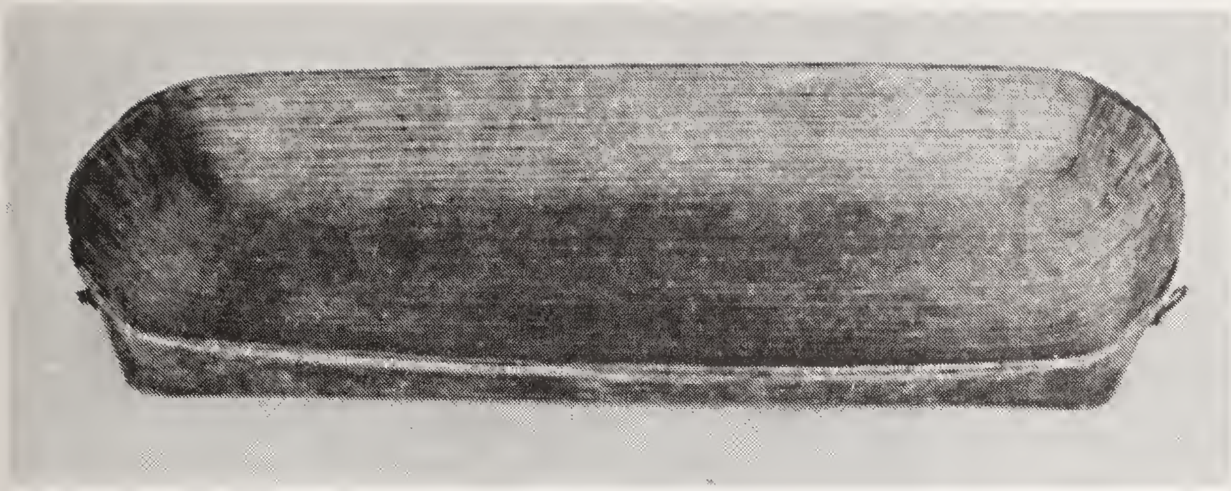
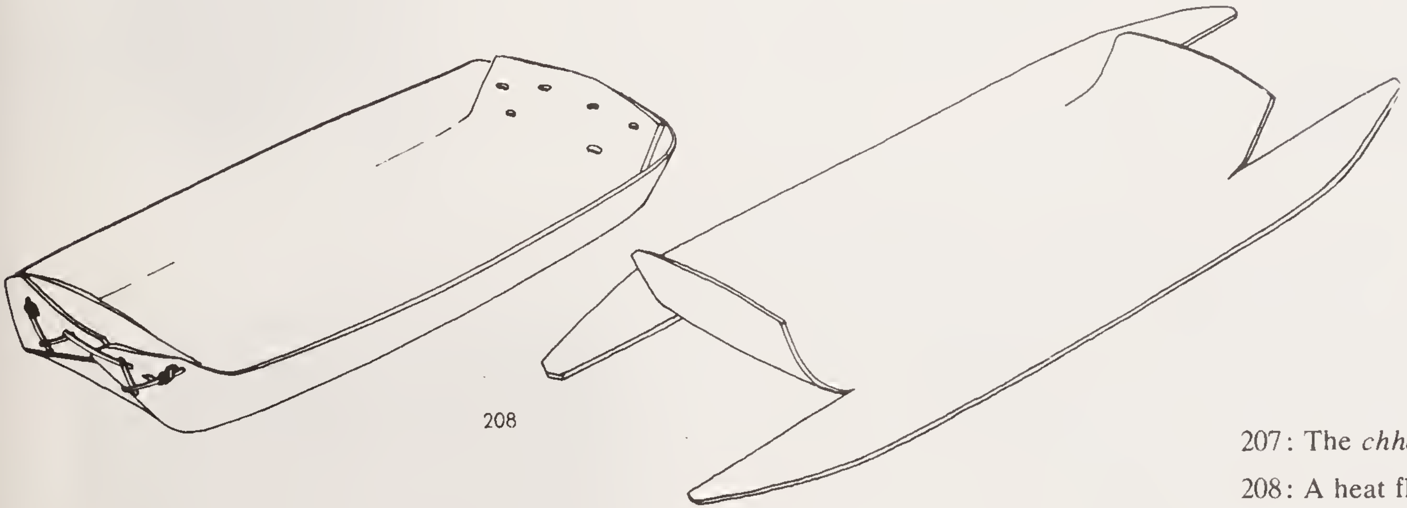


207

Large drums used to store rice beer are fabricated from the heat-flattened sheets. A number of pieces are overlapped and stitched with cane to form a cylinder of the required diameter. The base is also made from overlapped pieces and stitched to the cylindrical sides with cane splits. The resin, *papoo,* of a tree is used to seal the joints. This resin is not drained from the tree, but the bark is pounded, mixed with water and boiled to form a paste. This is applied on all the joints, and on drying renders the drum completely waterproof.

The Changs profess that, apart from the *talon* bamboo, the *puek* can also be heat-flattened, but its uses are limited due to its short internodes. They do not use any resin to help flatten this bamboo, but like the Khoibu craftsmen they only use the internodes which have to be peeled before flattening.

The Apa Tani and Nocte tribes of Arunachal Pradesh also make rice plates from heat-flattened bamboo (figs. 205, 206).



208

207: The *chhakhu*, a dish for rice.

208: A heat flattened bamboo sheet is cut, bent, moulded and stitched with cane splits to make the *chhakhu*.

Chhakhu

One of the Nocte rice dishes, the *chhakhu,* is an extremely elegant rectangular tray 565 x 275 x 50 mm (figs. 207, 208).

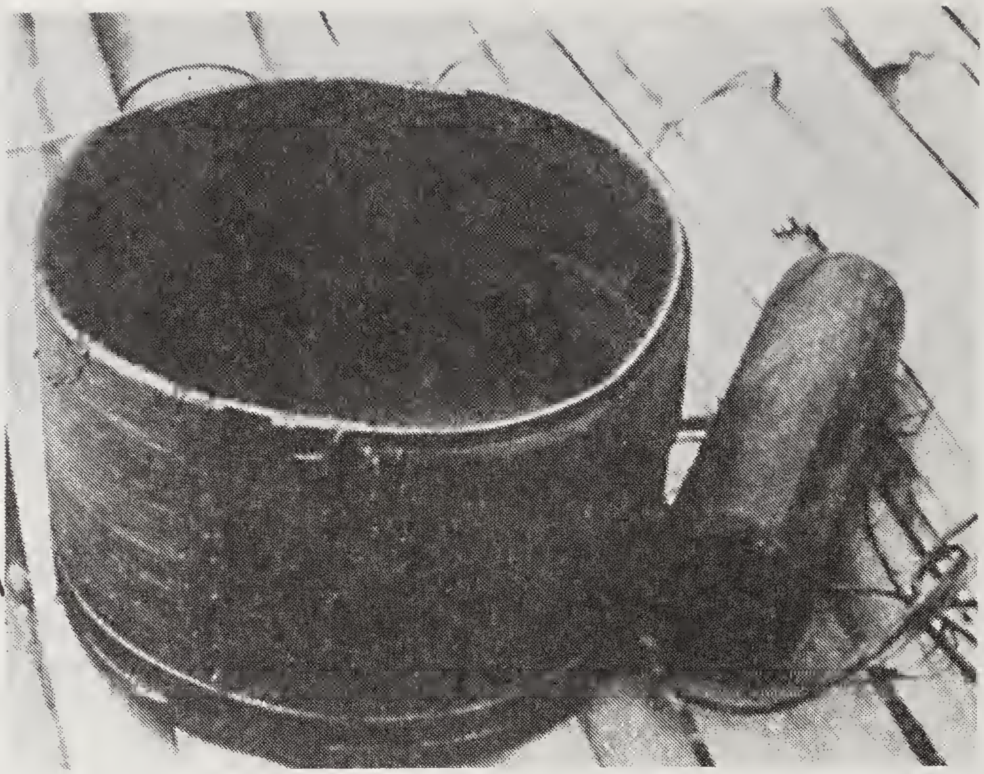
The internode of a bamboo is peeled, leaving only a narrow strip of outer skin along the length. The culm is slit through this strip, and flattened by heating it over a fire. The tray is formed by slitting both short ends of the sheet in two places dividing each end into three parts. The central portion is turned upwards and the side portions folded on to the vertical surface thus formed. The folds are held in place by large stitches made with split cane. Half the strip of outer skin of bamboo runs along each of the long edges of the tray, so that the wall thickness at the edge is slightly more than along the rest of the surface. The long sides are not vertical, but take the natural curve formed by folding the ends. The top edges of the shorter sides are cut to form a curve flowing smoothly into the long edges of the tray. Unlike the Khoibu boxes, the inside surface of the internode remains the inside surface of the tray.

209: The *chahok*, a Nocte container for rice beer.

210: A pair of rice beer containers showing the side and base details.

211: A cutaway diagram showing the construction of the *chahok*.

212: A standard measure for rice maintained by each Nocte chief.



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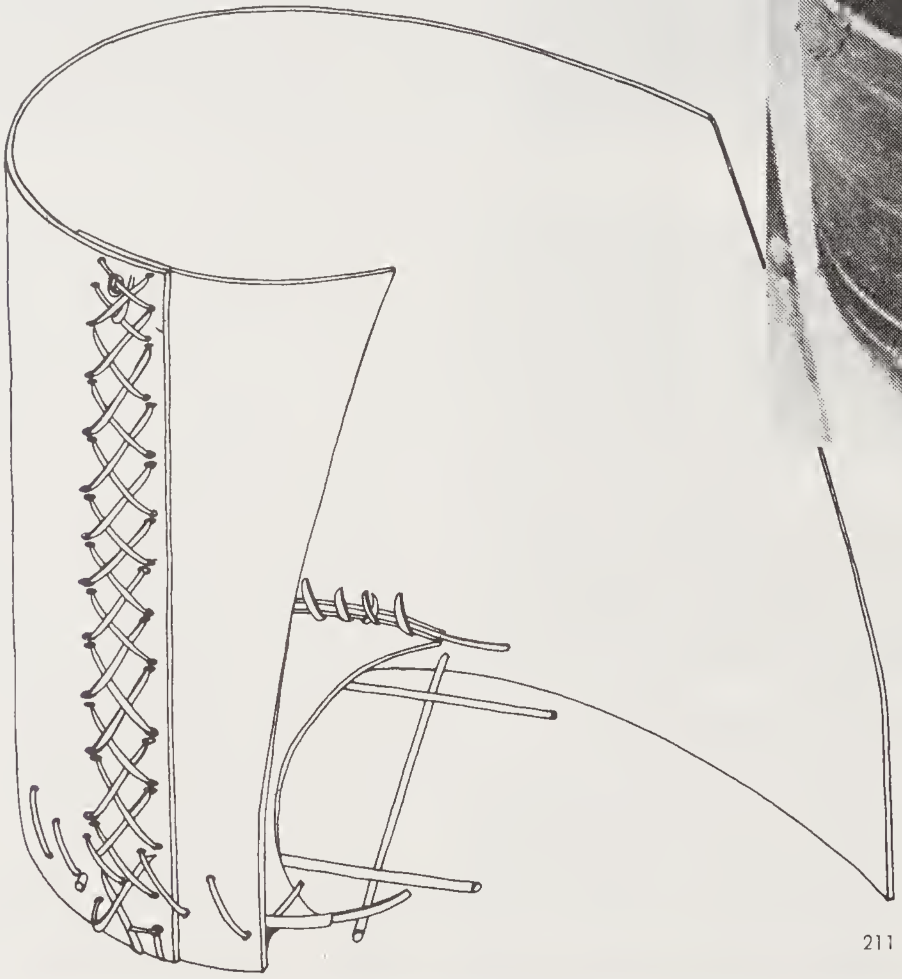

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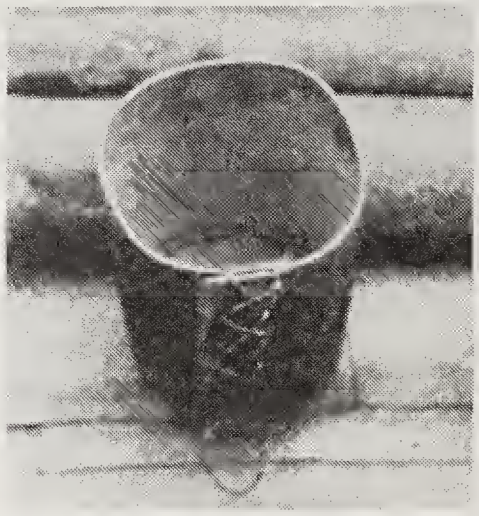

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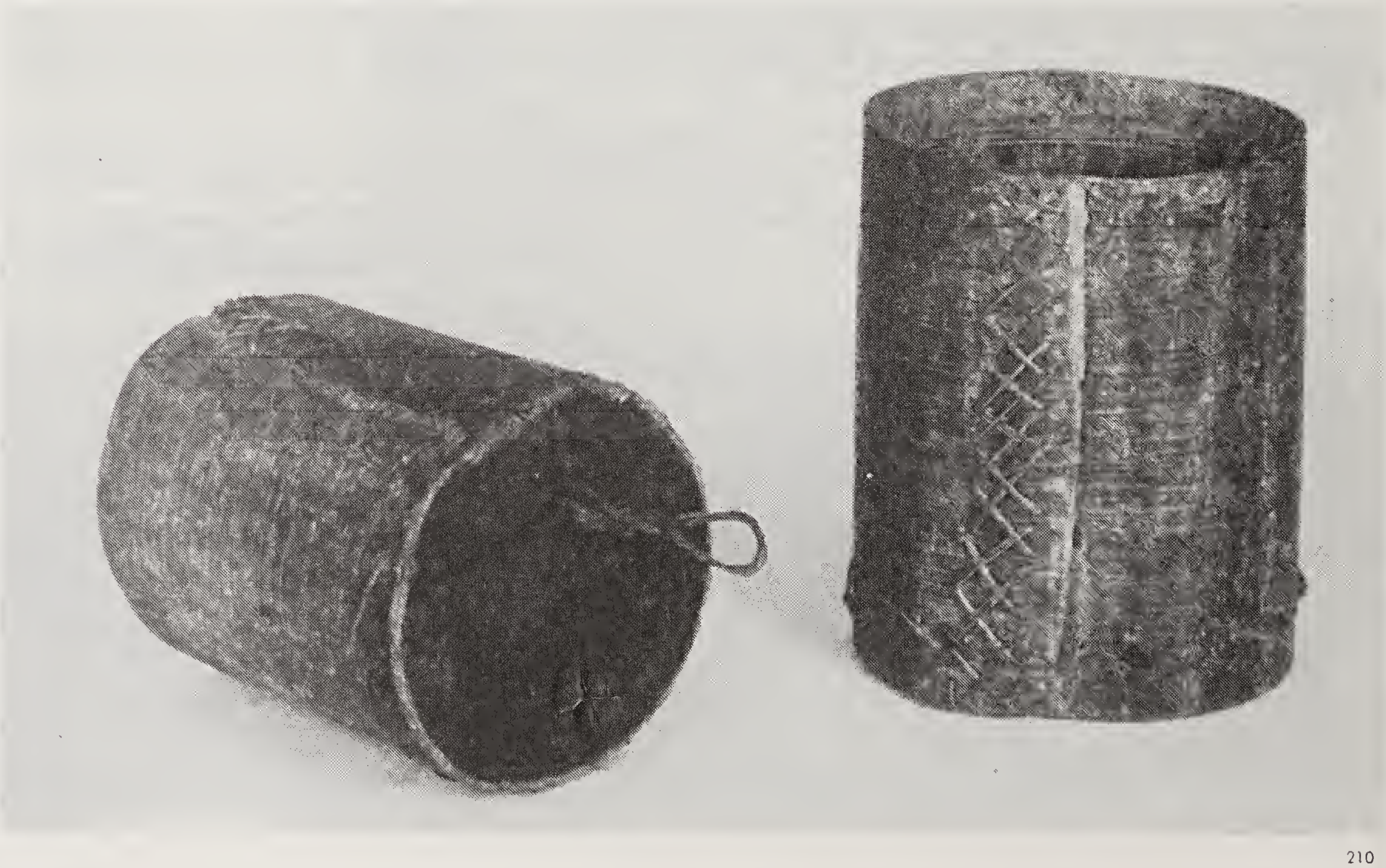


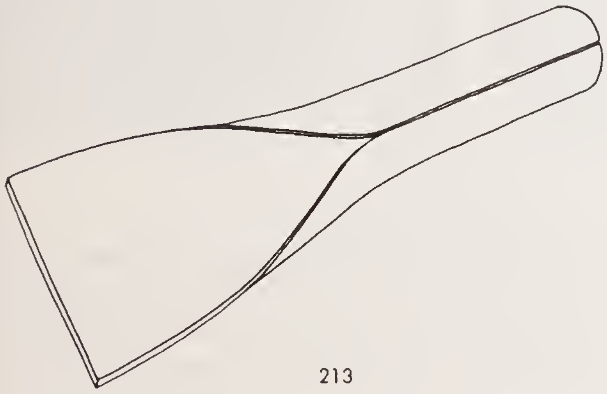
210

Chahok

Another Nocte product made from flattened bamboo is the *chahok,* a cylindrical container for rice beer measuring 165 mm in diameter and 210 mm high (figs. 209, 210). A heat-flattened sheet is bent into a cylinder and the overlapped ends are tacked together with a thin cane split to form an attractive cross-stitch pattern along the height of the cylinder. Another piece of flattened bamboo sheet is cut to form a circular plate and is pushed into the cylinder to form a base located about 25 mm above the lower edge. The diameter of the circular plate is a little larger than that of the cylinder. As it is pushed into the cylinder the edge of the plate turns slightly upwards to lie along the inner surface of the cylinder. This edge is covered with a strip of cane which is held in place by a cane split tacked onto the sides of the cylinder through the base. Four bamboo sticks are arranged to create a square underneath the base to prevent it from sagging (fig. 211). The sticks, of which one pair is above the other, have their ends protruding through the sides of the cylinder. A soft resin is used underneath to seal the joint between the base and the wall of the cylinder, and to hold the sticks in place. Here again the inner surface of the internode is used as the inner surface of the container. Similar containers are used by the Noctes to measure rice (fig. 212).

Monpa Flattened Bamboo Containers

The Monpas from Kameng, the western district of Arunachal Pradesh, make very interesting containers from flattened bamboo. Living at fairly high altitudes where very little bamboo grows, it is particularly creditable that these people collect bamboo from some distance away and use it with such refinement.



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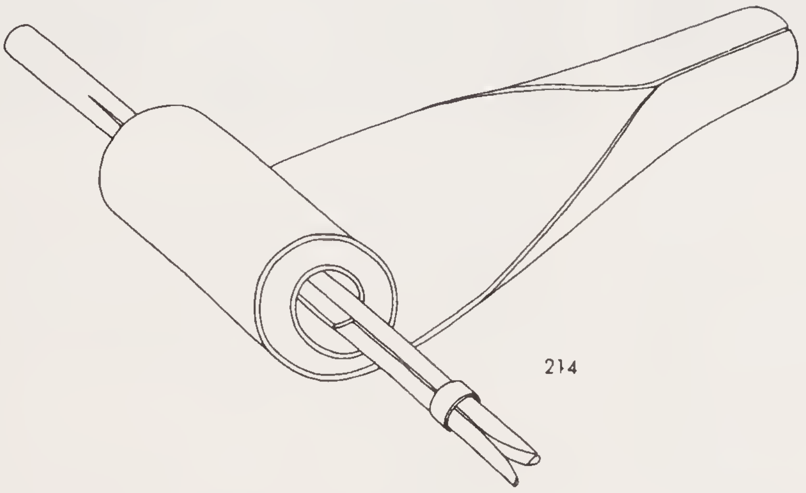


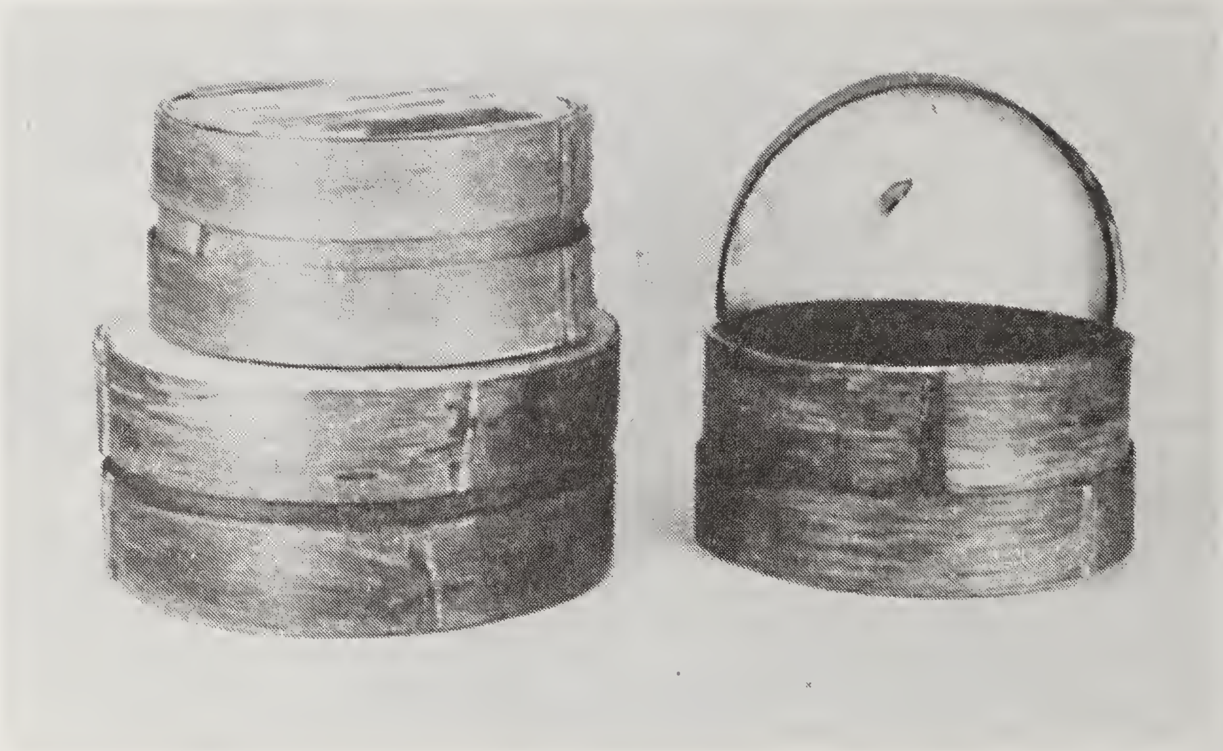
214

213: First stage in heat flattening bamboo by the Monpa technique.

214: The culm is flattened bit by bit and rolled onto the clamp.

The most interesting aspect of the Monpa technique is that the freshly-harvested bamboo is flattened with the outer skin intact and that the internodes as well as the nodes are opened out simultaneously. A tool, the *kampa,* is used to assist in this process. This is a bamboo clamp similar to the one used by the Manipuris at Khoibu and it is made from a whole bamboo that is partially split along the length. The split end of the clamp is held tightly pressed together by a braided cane ring called the *mier.*

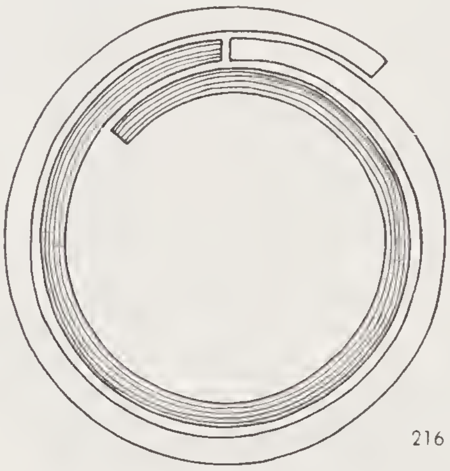
A portion of a freshly-harvested one-year-old culm of *she* bamboo is partially slit along the length after the outer nodal rings have been scraped off (fig. 213). The edge is heated, forced flat and held within the clamp. The clamp is held in both hands, pressed and rolled on the ground, wrapping the flattened bamboo sheet around it. The bamboo is flattened bit by bit, by extending the slit short distances at a time, heating that portion and rolling it onto the clamp (fig. 214). At the node, the transverse wall (diaphragm) is knocked out and the inside surface is scraped and scoured with a small knife. The flattening process is then continued along the length of the culm.



215

215: The *bamzi*, container used by the Monpas to store food.

216: A section through the lid and body of the *bamzi* showing the position of the two spirals.



216

These spirals of flattened bamboo called *hooie* are stored till they are converted into cylindrical containers of different sizes, depending on the intended function. All these products use the outer skin of the bamboo on the outside of the containers.

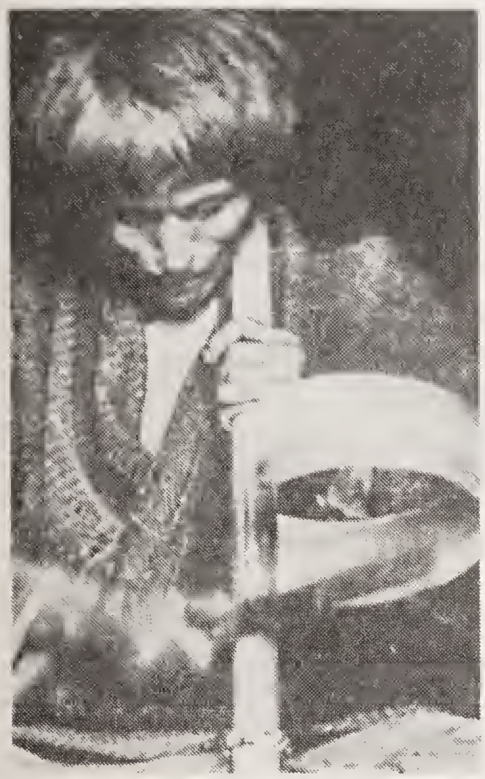
Bhray

The *bhray*, the simplest of the Monpa containers, is used as a measure for grain. A length of *hooie*, 2 mm thick and 85 mm wide is cut to make a ring 140 mm in diameter. The ends of the ring are overlapped, and holes are pierced through both layers with a pointed tool. A cane split is used to stitch the layers together. The stitches, staggered at an angle, lie within a shallow vertical groove cut along the outside edge of the overlapped sheet. The cane stitches holding the inside edge of the overlap in place are short and spaced apart. A circular disc of wood fits into the bottom of the cylinder to form the base. The gap caused by the thickness of the inside edge of the overlap is plugged with a chip of wood. The wooden base is held in place by three small bamboo pins driven into its edges through the sides of the cylinder. A strip of leather is forced through a hole in the centre of the overlap and knotted on the inside. A buttonhole-like slit in the leather is used to hang the *bhray* when it is not in use.

Bamzi

The *bamzi* is a flat cylindrical box with a lid, used to store butter and cheese. It comes in two sizes, the larger being 320 mm in diameter and 140 mm in height and the smaller 280 mm in diameter and 150 mm in height (fig. 215).

The method of closing these containers is very interesting. The flattened bamboo sheet used to make these containers is 2 to 3 mm thick. Hence, when a ring with overlapped ends is made, in effect a shallow spiral is created with the deflection over one turn being equivalent to the thickness of the bamboo sheet. As the lid fits over the container, the lid-spiral must begin where the container-spiral ends (fig. 216). This means that the inner vertical edge of the lid-spiral butts against the outer vertical edge of the container-spiral so that a continuous two-turn-spiral is formed. Thus the lid-spiral tightens onto the container-spiral if rotated. This principle was seen in a beautiful, small container at the Subansari District museum at Hopoli (fig. 217). When placed in the correct orientation, the lid slid onto the container without any effort. It was impossible to put the lid on in any other position.



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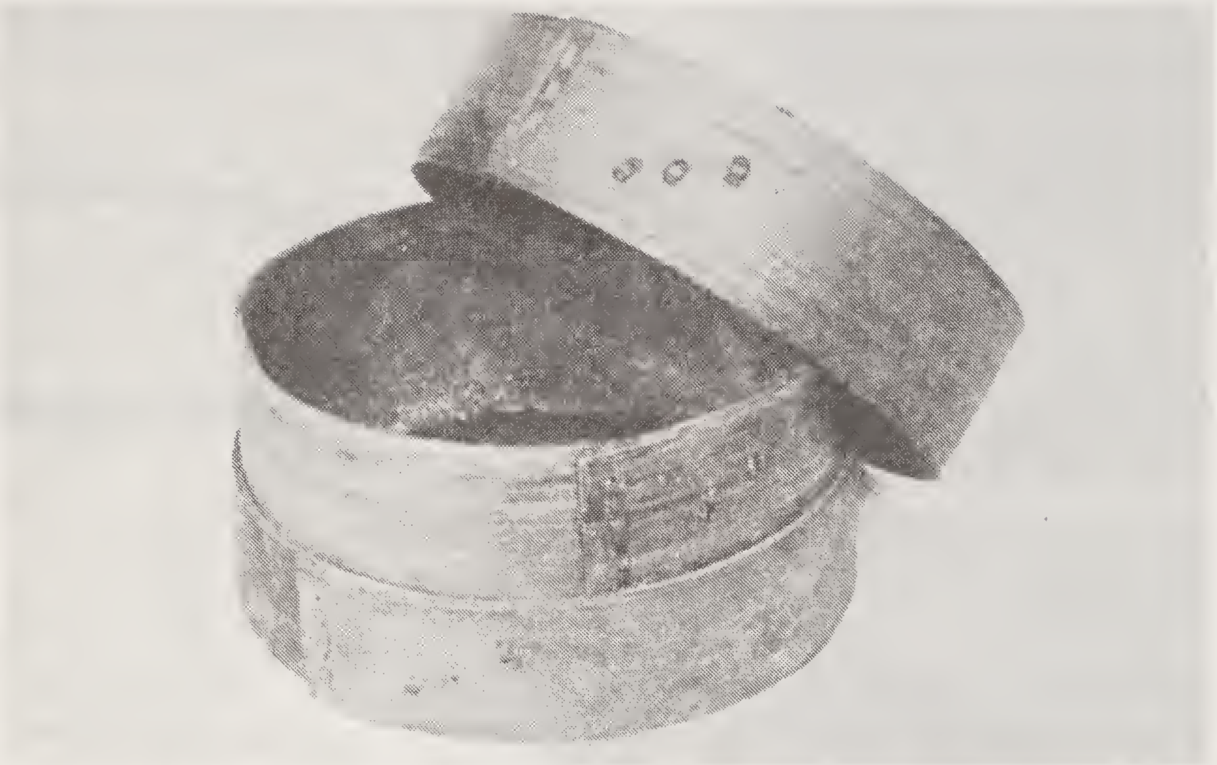

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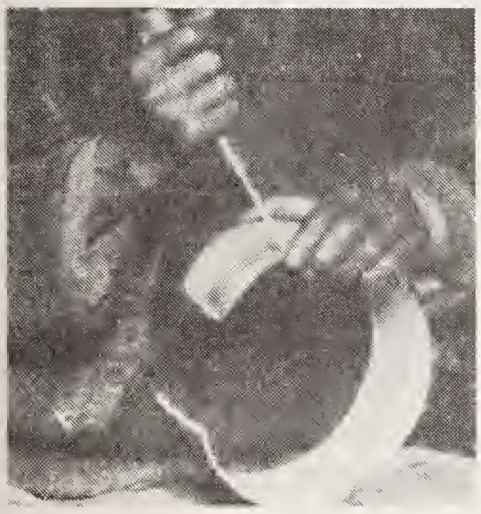

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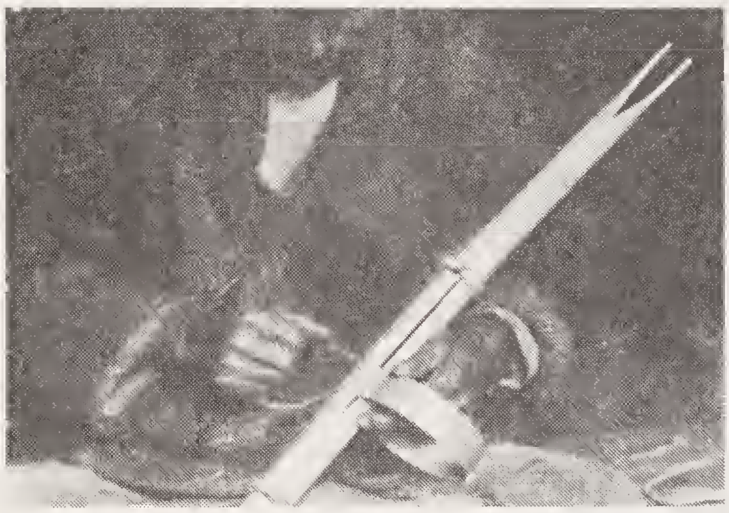

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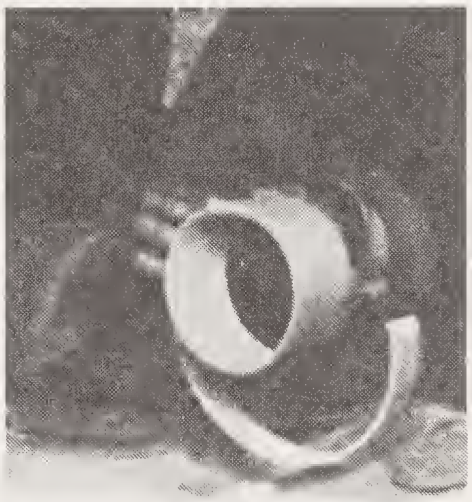


221

Both the *bamzi* and its lid which is called *zaikang* are made in the same way as the *bhray* (figs. 218-221). The container portion has an additional spiral ring of bamboo near the base. This ring is in the same position that the lid should be to close the box. By aligning the outer vertical edge of the lid with the outer vertical edge of the ring, it is possible to orient the lid to close the box easily. The vertical groove in which the cane stitches lie is particularly necessary in this container, where the stitches should be flush with the surface so as not to obstruct the lid. The wooden base of the container and the top of the lid are fixed with bamboo pins as in the *bhray*. Here the wooden discs are slightly notched to allow for the thickness of the inner end of the spiral. The ingenious principle of the spiral allows the container to be fairly tightly closed as a slight rotation of the lid spiral makes it eccentric, thus jamming it tightly against the surface of the container spiral.

217: A *bamzi* seen at the museum at Hopoli.

218: The bamboo sheet is held in a clamp while the edges are cut and finished.

219: The grooves and holes for binding are marked.

220: The ends are stitched together with split cane.

221: The lid element is measured over the container to ensure a good fit.

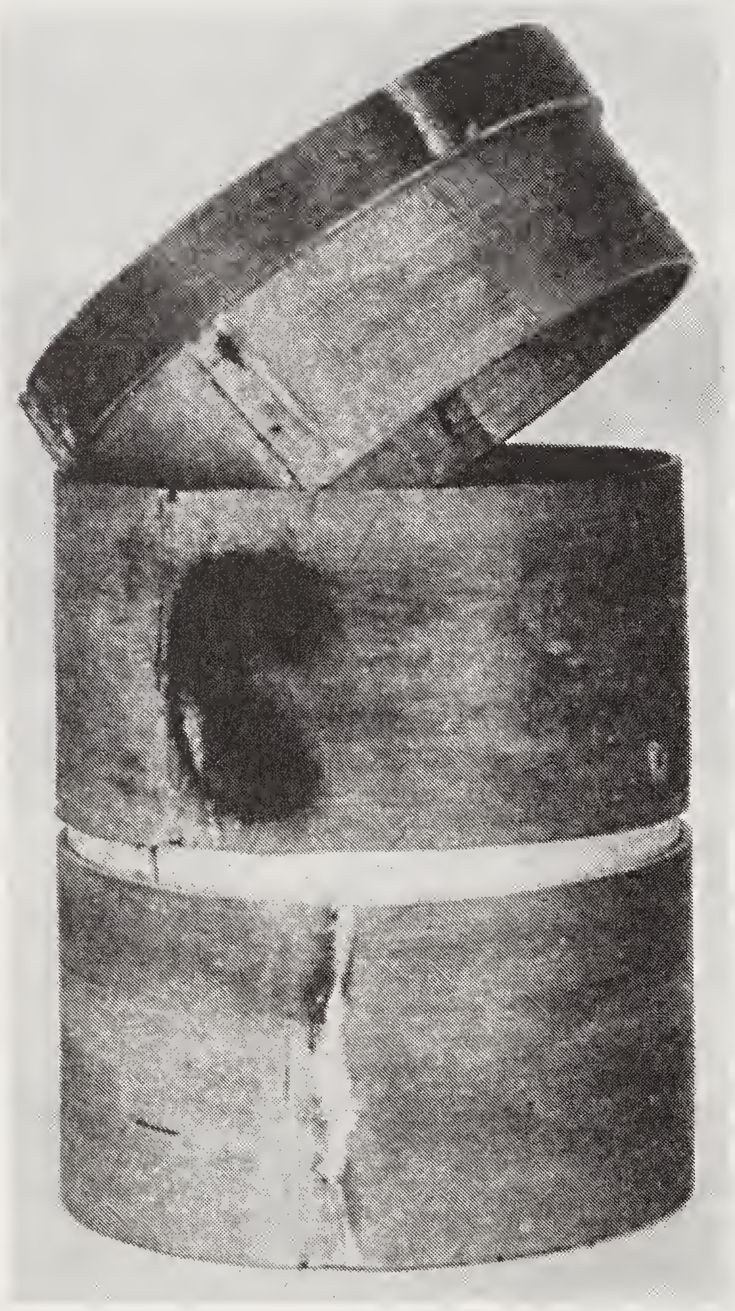
Lakhji

The third type of flattened bamboo container made by the Monpas is the *lakhji*, a milking pail (fig. 222). Here the container is fabricated from four pieces of flattened bamboo, two of which are considerably thinner as the outer skin is removed. A cylinder is made from the thin pieces, each forming a little more than a semi-circle.

These are arranged so that if they were to continue around the cylinder they would form two concentric spirals. Thus one vertical edge of each semi-circle lies on the outside of the cylinder. One of these edges is thinned down to lie flush with the surface of the cylinder. A wide bamboo ring is

222: The *lakhji*, a milking pail.

223: Cutaway diagram of the *lakhji* showing its construction.



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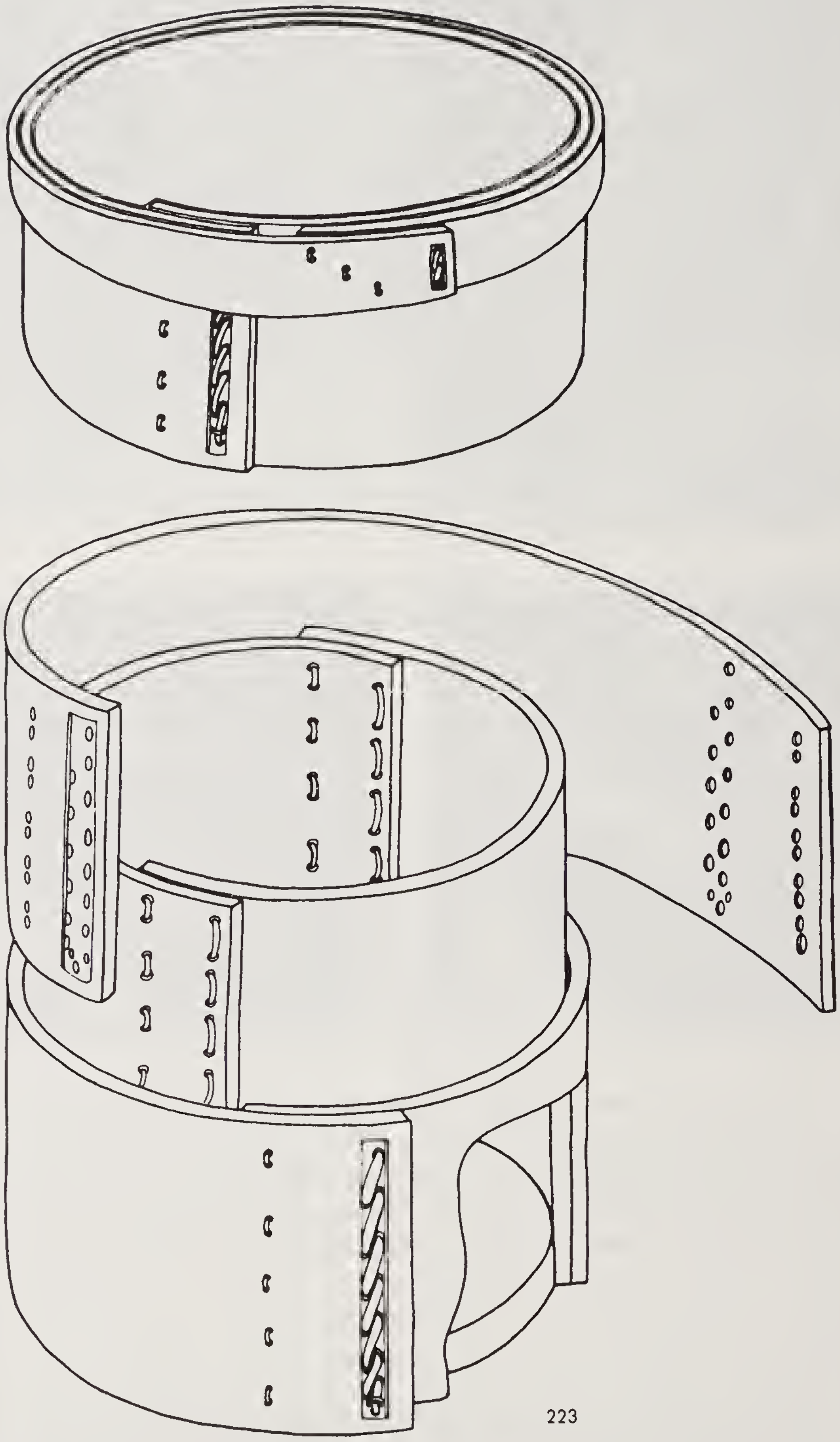

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fitted on the lower portion of the cylinder with the inner end of the spiralling ring butting against the thick vertical edge on the inner cylinder. Another wide bamboo ring is fitted in the same position a little above the first one so that its top edge lies about 50 mm above the edge of the inner cylinder. Therefore, all that is seen of the inner cylinder is a narrow band between the two outside rings. The top ring is held on the cylinder by two or three small cane stitches. The lower ring is held in place with bamboo pins that go through it and the inner cylinder into the edge of the wooden base (fig. 223).

The lid of the *lakhji* fits inside the container rather than over it, as is the case in the *bamzi*. Therefore it has an additional narrow ring fixed to the top edge, which when aligned with the rings on the container ensures that the lid is positioned correctly for closing. Two knotted yak hair handles are looped through holes in the container on opposite sides.

Whole Culm Containers

The cylindrical bamboo culms, with a lumen and transverse nodal walls or diaphragm, make ideal natural containers. This aspect of bamboo is widely exploited and the various shapes and sizes depend largely on the diameter and internode length of the species of bamboo used and the function that the container is to fulfil. The nodal wall forms the base of hollow cylindrical internodes. The natural joint between the base and walls of the internode ensures that these containers are waterproof. This is important because water is scarce in hill villages and often needs to be transported from some distance away. Bamboo tubes are used for this purpose, a typical example being the Mizo *tuium*.

Tuium

The *tuium* is made from a bamboo with a diameter of about 100 to 140 mm and an internode length of 450 to 600 mm. Two internodes are used to make a water tube 900 to 1,200 mm long with one nodal wall forming the base. The nodal wall between the internodes is pierced to connect the lumen. Half the circumference of the top open edge of the tube is cut at an angle to facilitate pouring. The outer skin of bamboo is removed and the nodes scraped off to reduce the weight of the tube, to prevent it from cracking, and to keep the water cool by evaporation through the internodal walls. This type of water tube is also seen in Arunachal and Nagaland, though in some places only one long internode was used.

Dimasa Cachari Water Container

The Dimasa Cacharis of Samkhor village use a slightly different form of tube (fig. 224). There the tubes have a nodal wall at both ends. The top is pierced to create a small hole through which water is filled. A wad of leaves is used to plug the hole to prevent any water from spilling. On one side of the top edge a vertical splint from the following internode is retained to serve as a handle.

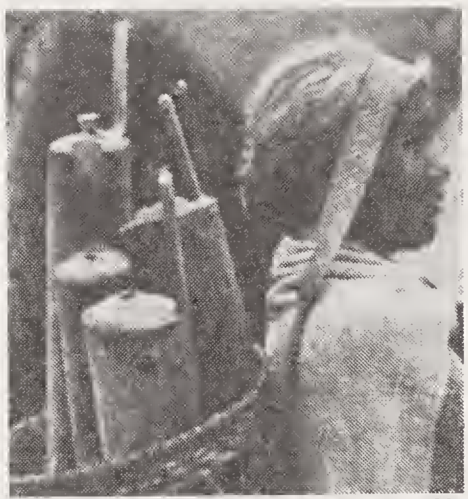
All these water tubes are made of locally available, fairly large diameter bamboo. If the bamboo has short internodes, two or three may be used for one water tube, and the nodal wall in between is pierced to connect them. The water tubes are fairly large. Much smaller products like mugs for rice beer and water as well as containers for salt and tobacco are made from whole bamboo culms.

Drinking Glasses

The simplest of these is a small version of the water tube. Disposable bamboo glasses are used during feasts and other occasions where large numbers of people are served. Culms of about 80 to 110 mm in diameter are cut into appropriate lengths, with the nodal wall at the base retained. The top is cut at an angle producing an elliptical opening. The outer skin of these glasses need not be peeled as they are thrown away after use. More elaborate, permanent mugs are generally made with handles, the main difference between them being the way the handle is attached to the mug.

Angami Naga Beer Mug

An Angami Naga mug, 100 mm in diameter and 170 mm in height, is made from a portion of culm with the nodal diaphragm as the base (fig. 225). The outside ridge of the node is scraped off. The top edge is cut parallel to the base and the edge is chamfered inwards to form a thin rim. An angular hole is drilled from below the base to the side of the cylinder without piercing the container (fig. 226). A cane strip is pushed through the



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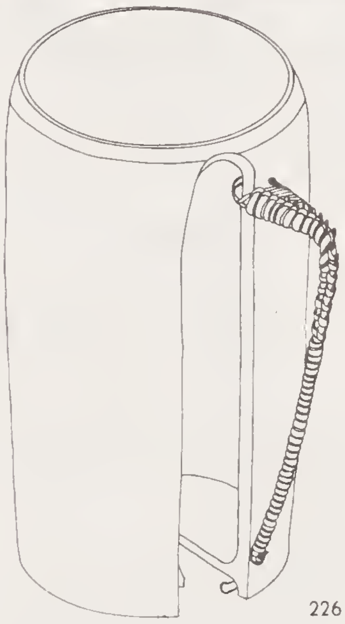

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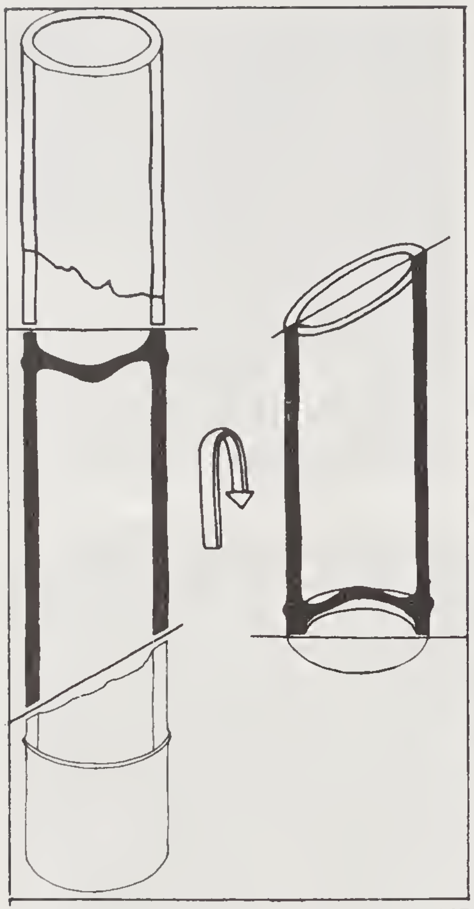
224: A Dimasa Cachari woman carrying water tubes.

225: The Angami Naga beer mug being used. The handle of a bamboo spoon is seen above the rim.

226: A cutaway diagram showing the construction of the handle.



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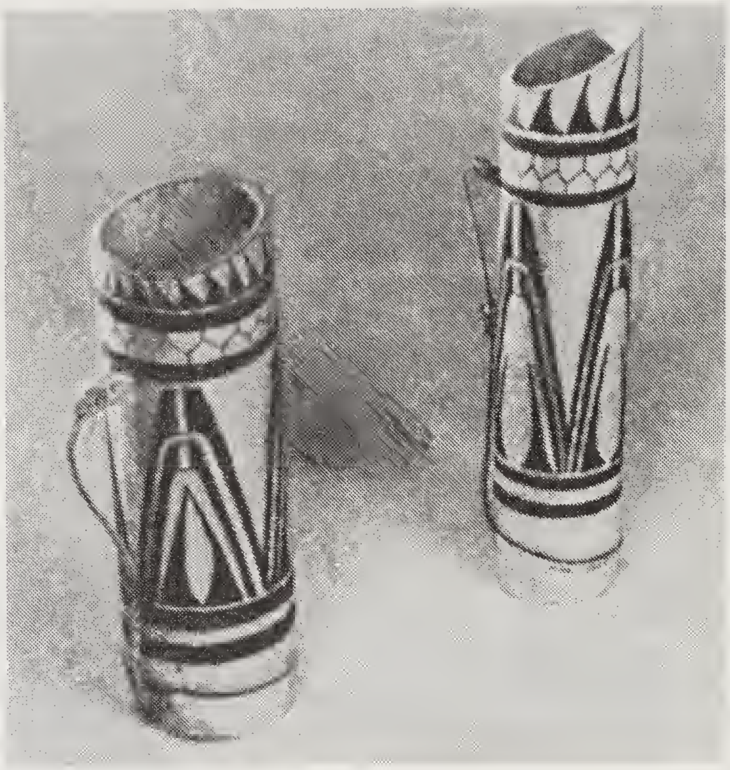

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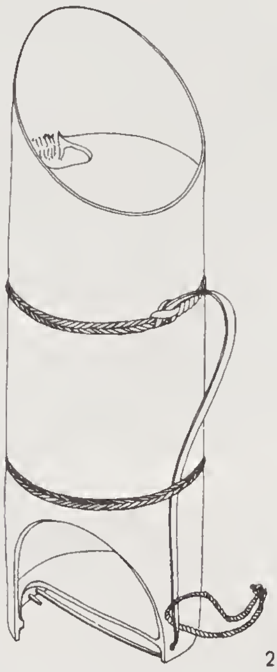
hole from below, and a thick end prevents it from slipping through the hole. The strip is looped towards the top, where it is split into two. Each half split passes through one of two holes near the top edge, to return outwards through the other hole, and lie on the sides of the handle. These ends are held together by a fine cane split, that is simply wrapped, half way down the handle and decoratively knotted over the two splits towards the top.

Chang Naga Mug

Chang Naga mugs from Tuensang are made from a portion of culm, one end of which is cut just above the node and the other end across the lower internode (fig. 227). This is turned upside down to form a mug with a nodal diaphragm as its base. In this position, the short portion of the following internode with a branch bud extends below the node to form the base ring on which the mug stands. The cane strip handle is attached to the cylindrical container in a manner similar to the previous mug. The knotted end of the strip prevents it from slipping through a hole which is pierced through the



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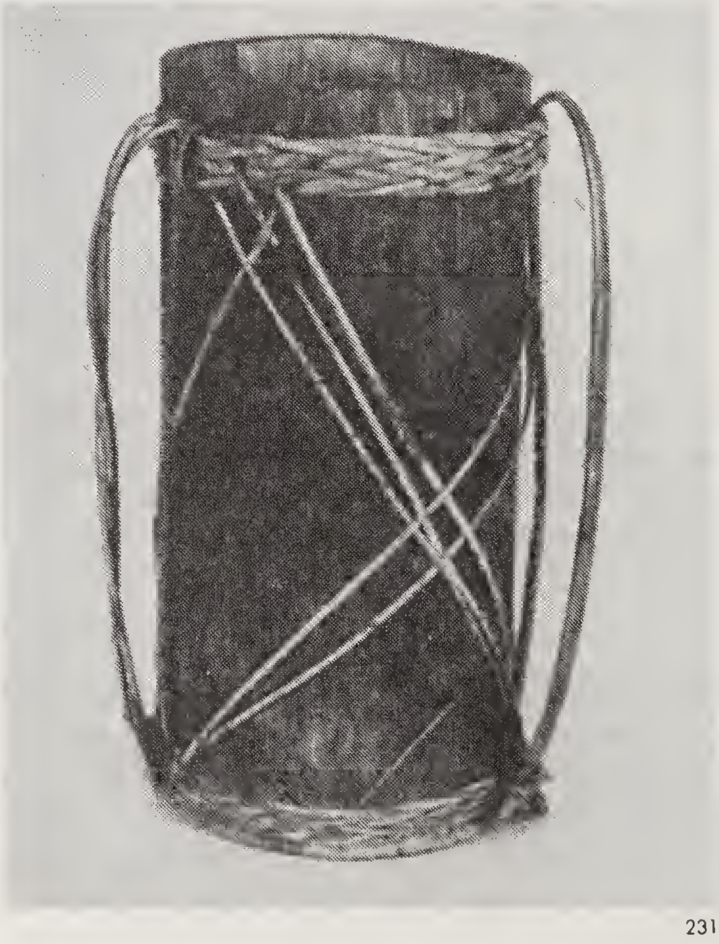

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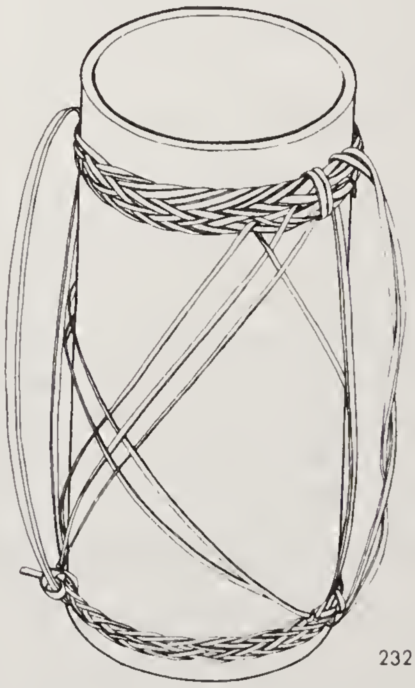

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227: A sectional view showing the orientation of the node in the Chang Naga mug.

228: Hot poker work decorates the Chang Naga mugs.

229: A beer mug from Tuensang.

230: A cutaway diagram showing the use of the nodes and the construction of the handle.

231: The Apa Tani salt container.

232: The construction of the handles.

soft branch bud at the base. The top of the handle is split in two and looped through two holes in the cylindrical wall near the rim. The ends of the split that return outwards through the holes are looped crosswise in a decorative knotted pattern over the handle where it pierces the container. The mug is decorated with bold tribal patterns that are burnt onto the surface with a hot poker (fig. 228).

Beer Mug from Tuensang

Yet another Naga mug from Tuensang village is cut from a culm of diameter 105 mm (fig. 229). One end is cut perpendicular to the axis just below a node to form the base. The other end is cut at an angle just above the following node to create a spout. The opening for the container is a hole in the top nodal diaphragm, just below the spout and near the cylindrical wall. The cane strip handle is fixed across the base, through diametrically opposite holes in the short cylindrical walls extending below the node. The end of the strip forms a short stitch on the surface as it returns through a third hole in the walls (fig. 230).

The top end of the handle is looped over and tied to a braided cane ring near the top. Halfway between this ring and the base, a second braided cane ring pins the handle to the side of the cylinder so that only the short open loop between the two rings is held in the hand. This is a very elegant mug, almost black in colour from constant smoking over the household fire.

Apa Tani Salt Container

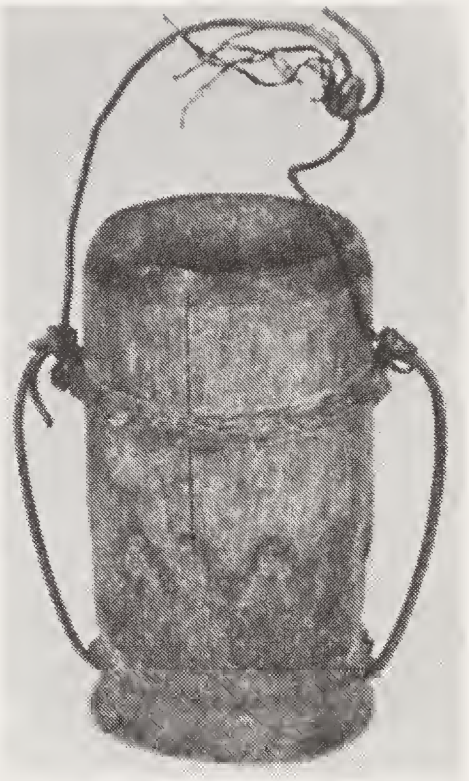
The Apa Tani container for salt is 110 mm in diameter and 240 mm high (fig. 231). The top edge is parallel to the base which is cut just below a node. The outer skin of the container is peeled off and two braided cane rings are made to encircle the base and top (fig. 232). Narrow strips of cane with the ends tied to a strand of braiding criss-cross between the rings. Two thicker cane splits are looped through both rings to form the handles. The ends of these handles are tied to the braided ring at the top or bottom. The cane splits are coarsely cut and tied and the product lacks refinement.

Khaplang

The *khaplang* is similar to the salt container but much smaller in size. It is 60 mm in diameter and 120 mm in height and is used by the Noctes of Arunachal for drinking rice beer (fig. 233). The top edge of the mug is chamfered inwards to create a thin rim. The lower portion of the mug is carved, a scalloped pattern on the sides ending in a ridge at the node (fig. 234). The ridge is notched all around the container, and below this the mug flares out slightly towards the base. A finely-braided cane ring located near the rim holds the top ends of the two diametrically opposite cane handles in place. The lower parts of the handles pass through the wall thickness under the node and the end is bent into a depression to prevent it from slipping out. The single cane strip that forms the handle is notched on top and bent over the braided ring to prevent it from slipping out. This little product is rather elegant, and more refined than the salt container.

Pekak

The *pekak* is a measure for rice used by the Adi Minyong tribe of Arunachal. Made like a beer mug, the nodal wall forms the base, while a portion of the internode forms the container. The wall thickness of the container is reduced all around, except for one narrow vertical strip where the original wall thickness is retained, to form a ridge along the side of the container (fig. 235). Two holes are pierced through the ridge, one at the top of the container and one at the bottom, such that the inner wall remains intact. A thick cane strip is looped through these holes and knotted at each end to form the handle.



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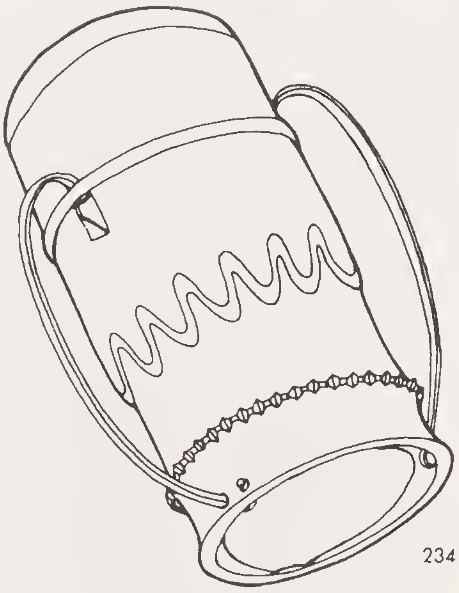

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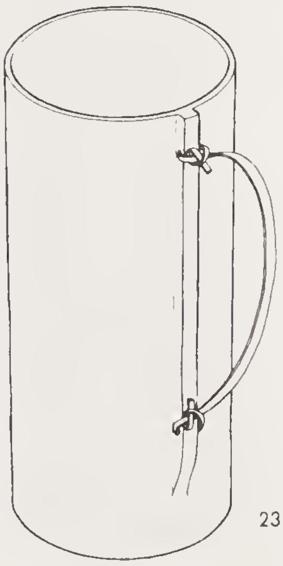

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233: The *khaplang*, a Nocte beer mug.

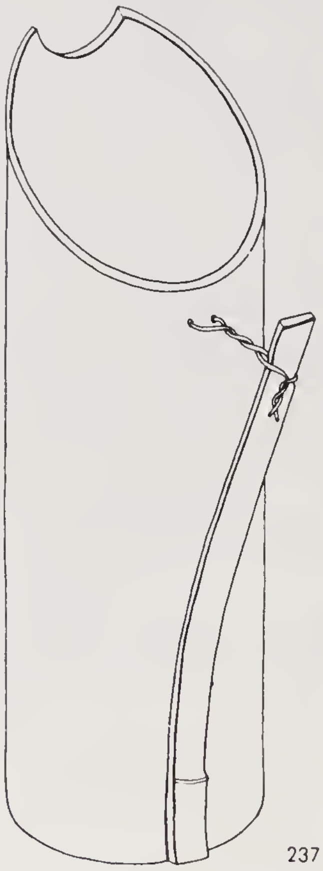
234: The *khaplang* viewed from the base.

235: The *pekak*, an Adi Minyong measure for rice.

236: A Konyak Naga beer mug.

237: A bamboo splint, partially split from the body, forms the handle.

238 : An Adi Gallong beer mug.



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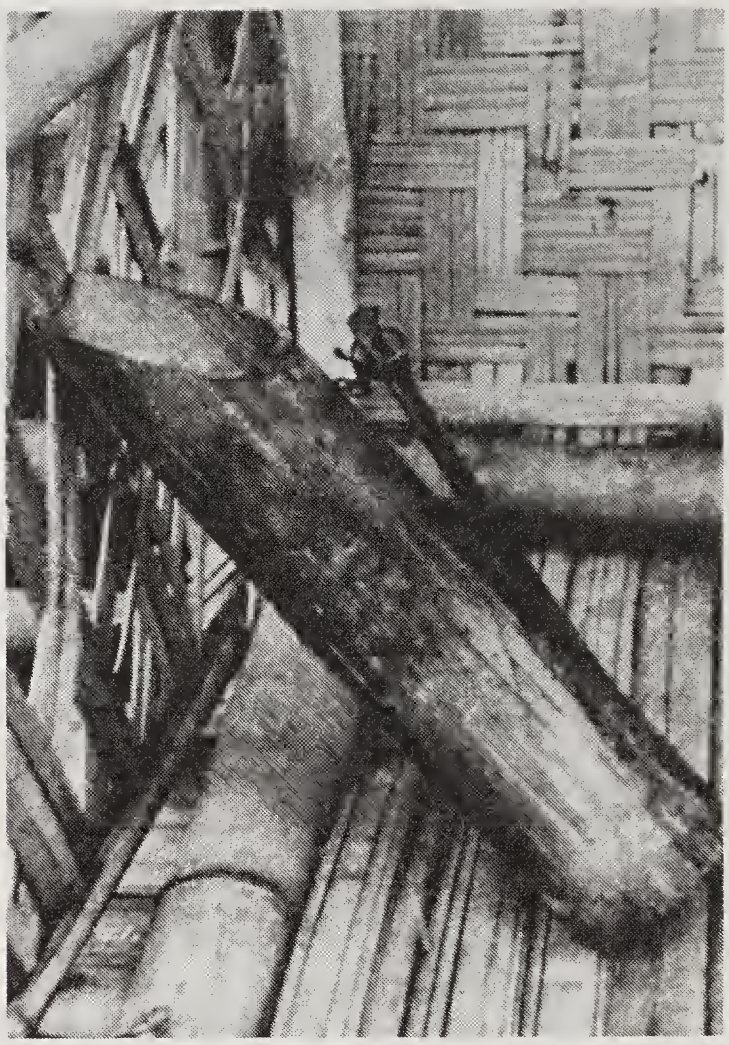

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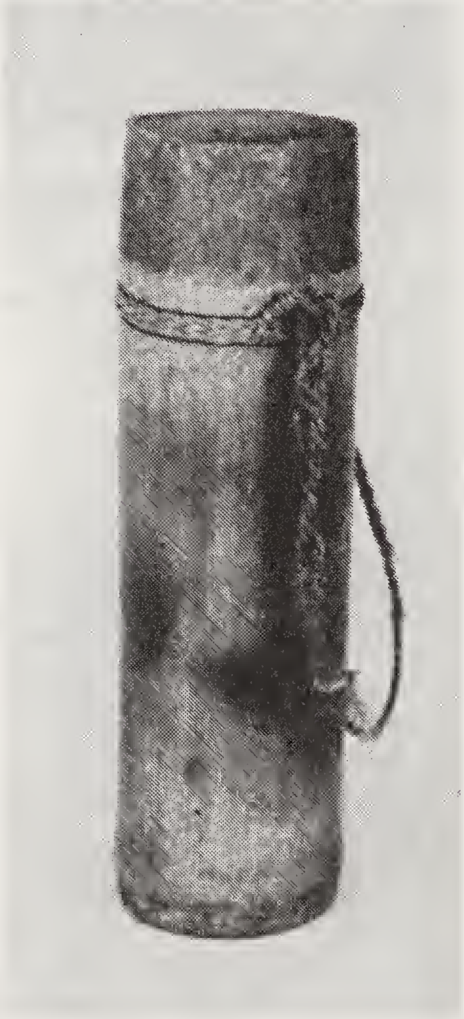

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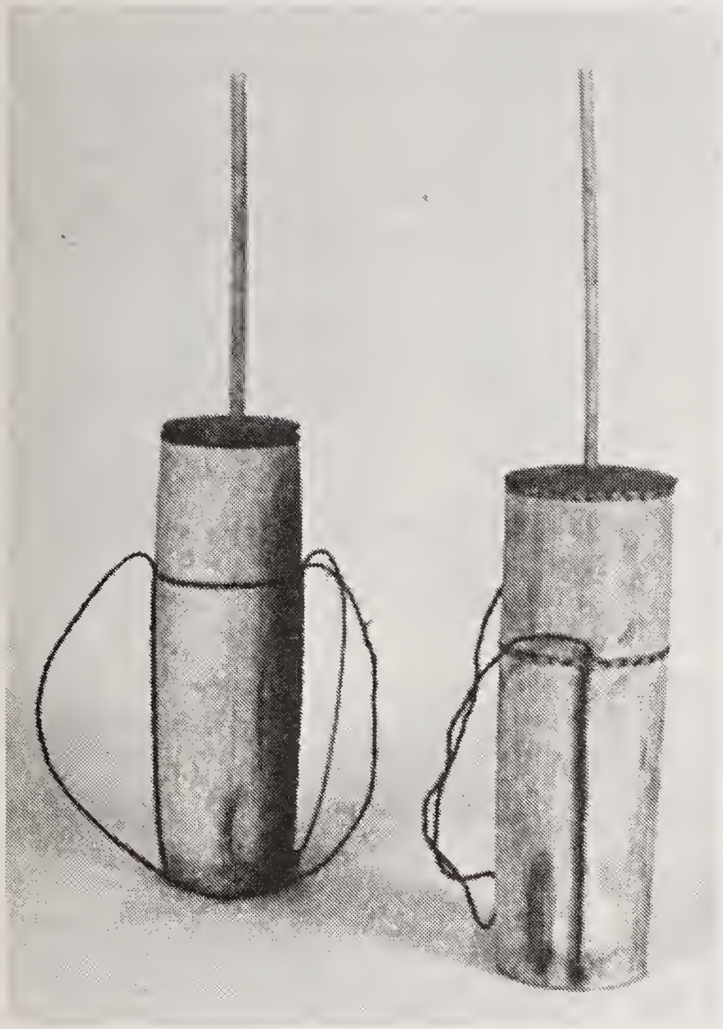
Konyak Naga Beer Mug

Another way of using the wall thickness of the culm to form the handle was seen in the Mon District of Nagaland (fig. 236). Here again a vertical ridge of the original wall is retained, while the remaining surface of the container is made thinner. The ridge is partially split from the container to form a splint that is naturally attached to the base (fig. 237). The splint is bent outwards and held at a fixed distance away from the top edge by a twisted wire looped around the top of the splint and tied to two holes in the cylindrical wall. The splint thus becomes the handle of the container.

Adi Gallong Beer Mug

The Adi Gallong beer mug is shaped at the top by shaving off the outer surface to reduce the wall thickness at the rim (fig. 238). A braided cane ring is held in a shallow groove around the container just below the chamfer. Two cane loops fixed onto the braided ring are used to hold the ends of a long flexible braided cane handle which passes over the mouth of the container.

It appears that as bamboo grows, the nodal walls tend to sag slightly downwards to form a semi-spherical depression. If the culm were cut near the node, the curved nodal diaphragm would protrude below the base-ring formed by the wall thickness of the culm, to create an unstable base. If a stable base is to be made, the culm must be cut at some distance below the node so that the base ring lies well below the curved underside of the diaphragm. However, if the culm is used upside down, the nodal diaphragm will curve inwards, into the container, and the base-ring can be cut very close to the node. The fibres of bamboo cross link at the node. To prevent the base from splitting, the base-ring should be as close to the nodal diaphragm as possible. The understanding that the craftsmen of Northeast India have about bamboo is reflected in the construction of the Adi Gallong beer mug. The external nodal ring clearly indicates that the culm has been used inverted to solve the above problem as in the Chang Naga mug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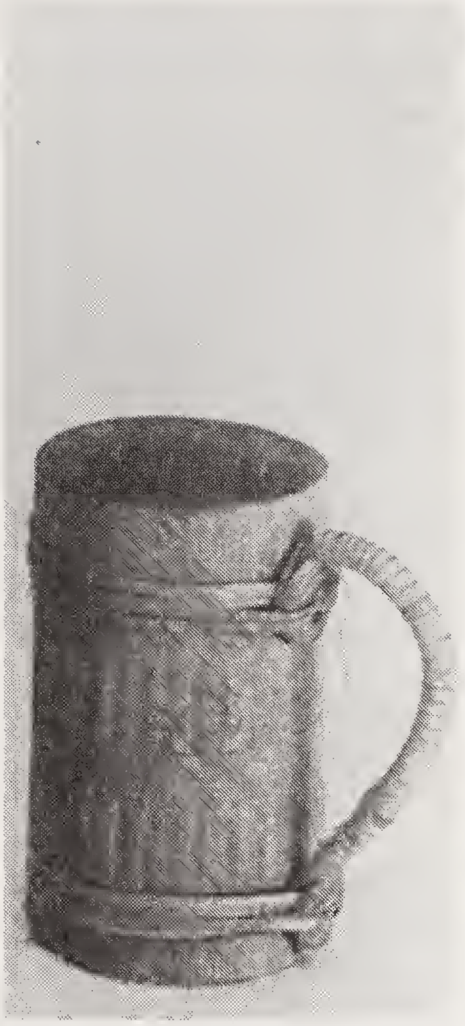
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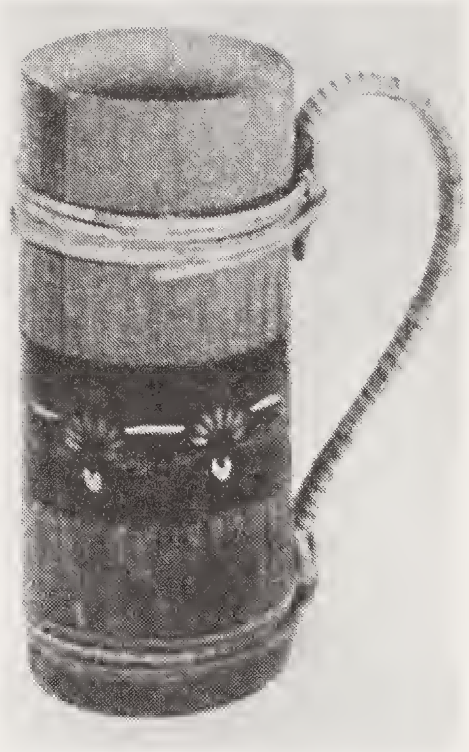
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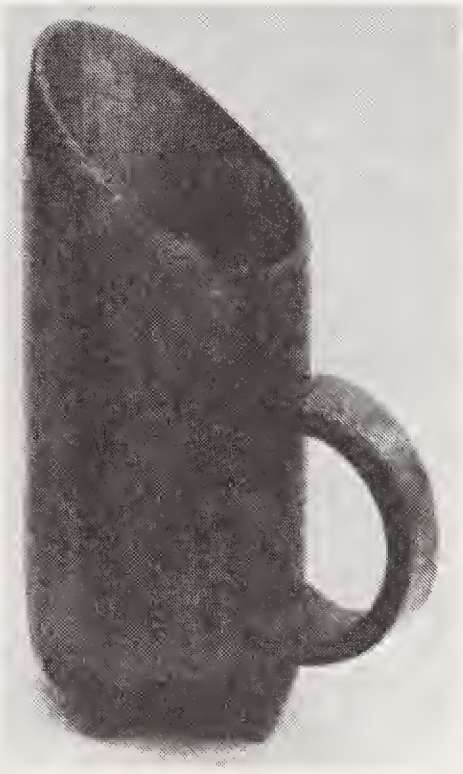
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(fig. 227). The concave bases of the other mugs too indicate that they have probably been made the same way, but since the external nodal ring has been scraped off, it is not as obvious.

Beer Mug from Nalbari

Nalbari is one of the handicraft centres in Assam where whole bamboo mugs are made. These mugs are basically similar to the native mugs in the way the culm is used (fig. 239). In Nalbari, the surface of the mugs are carved and decorated with oil paints. The bent cane handles are fixed to the container by wire and nails which are then hidden by decoratively tied cane strips (fig. 240). By trying not to mar the surface of the mugs, the rim is made thinner by shaving the inside of the container, thus exposing cut bamboo fibres. This means that any liquid poured into the container can easily seep into the walls, thus making it susceptible to deterioration. These handicraft mugs are more garishly decorative than functional.

Beer Mug from Kohima

A handicraft mug from Kohima in Nagaland is slightly better than the Nalbari mugs in some respects. The base rim is carved so that the mug stands on four points rather than on a circular rim (fig. 241). The external nodal ring is shaved off and the top edge is cut at an angle. A bamboo culm of the same diameter as the mug is cut to form a semi-circular ring which is used as the handle. This is stuck onto the cylinder with a synthetic adhesive. The mug is varnished on both its inside and outside surfaces. While this mug has no painted decorations, the way the handle is fixed indicates that it is definitely not a native product.

Beer Mug from Noklak

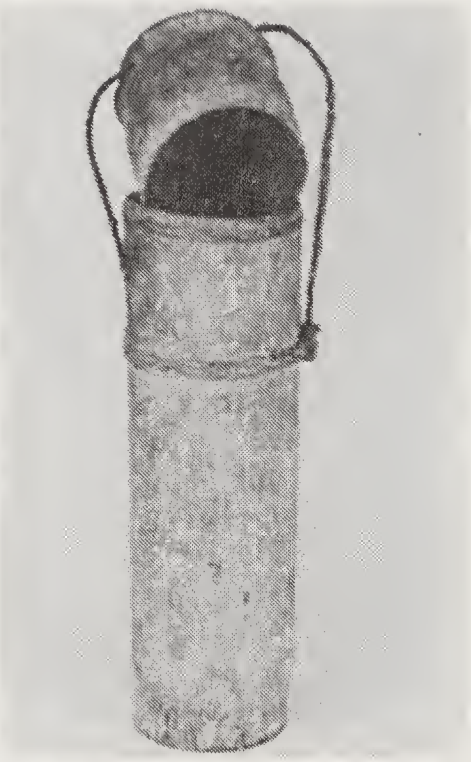
A beer mug made at the Noklak crafts training centre in Nagaland is a long cylindrical container with a lid, a cane handle and a rope strap from which the container can be hung vertically (fig. 242). A portion of culm

239: A beer mug from Nalbari.

240: Another beer mug from Nalbari.

241: A beer mug from Kohima.

242: Beer mugs from Noklak.



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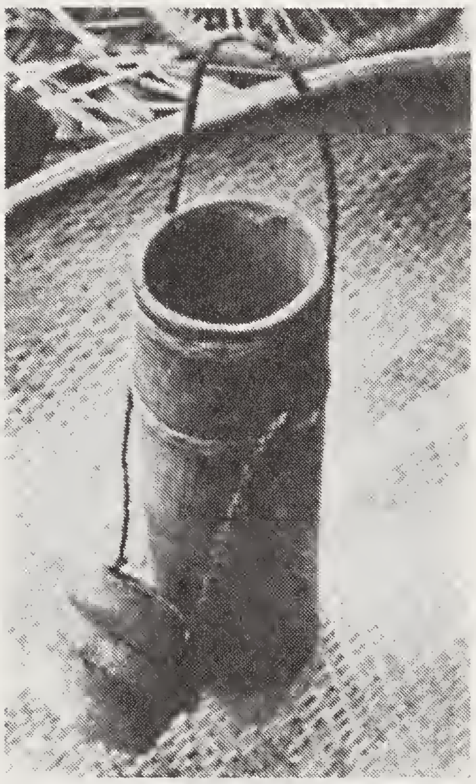

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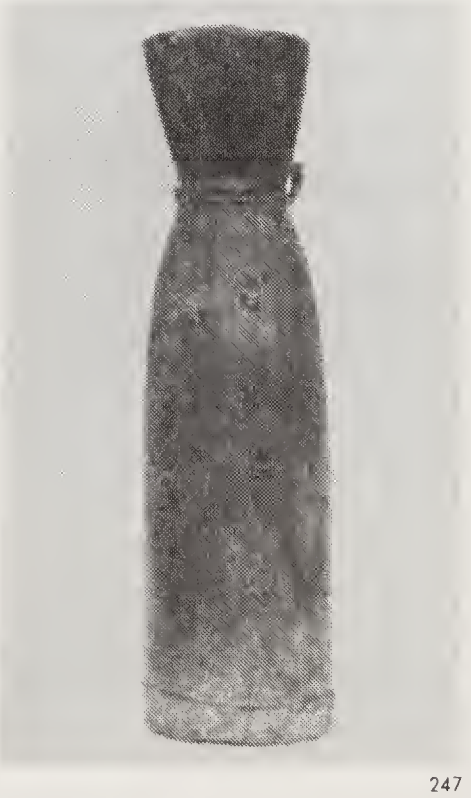

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310 mm high with an internal diameter of 90 mm is peeled to leave a wall thickness of about 2 mm. A nodal diaphragm forms the bottom of the container while the external nodal ring is scraped off. A stiff, dark-brown cane strip along the side of the container forms the handle, one end of which is looped through two holes at the base and knotted on the outside. The other end of the handle is notched on the inside surface and looped over a braided cane ring which holds it against the wall of the container. The fibre strap passes along opposite sides of the container to form a loose loop over the top. It is held against the sides by the braided ring holding the handle, and the ends are knotted through a hole at the base on one side and held in the knot of the handle on the other. A second braided cane ring encircles the upper rim of the container to prevent it from splitting.

The lid, 40 mm high, has a nodal diaphragm at the top, the walls of the internodes extending downwards. The external diameter of the internodal portion is reduced so that it fits inside the container like a plug. The top surface of the lid is shaped into a smooth, slightly convex curve, which extends to rest over the edges of the container. It seems that the lid is cut from a basal portion of the culm where the greater wall thickness would make it possible to reduce the outside diameter to fit the container. A reed bamboo straw enters the container through a hole at the centre, on top of the lid.

Thuppak

This is a container used by the Noctes of Arunachal Pradesh to store rice beer (fig. 243). It is very similar in construction to the mugs made at Noklak. A portion of culm with an internal diameter of 11 mm and a height of 370 mm is peeled and the external nodal ring at the base is scraped off. This container has a handle in the form of a circular braided cane strap that is anchored to the cylinder by a braided cane ring. It has a second braided cane ring encircling its upper edge, to prevent splitting. The lid is carved from a short portion of internode 115 mm high with the nodal diaphragm at the top of the lid. Only a short length of the lid fits inside the mouth of the container. Two lengths of circular braided cane rope are knotted through two holes at the edge of the lid. The end of each is tied to the braided cane ring around the container, so that when open the lid remains hanging at the side (fig. 244).

Other Containers

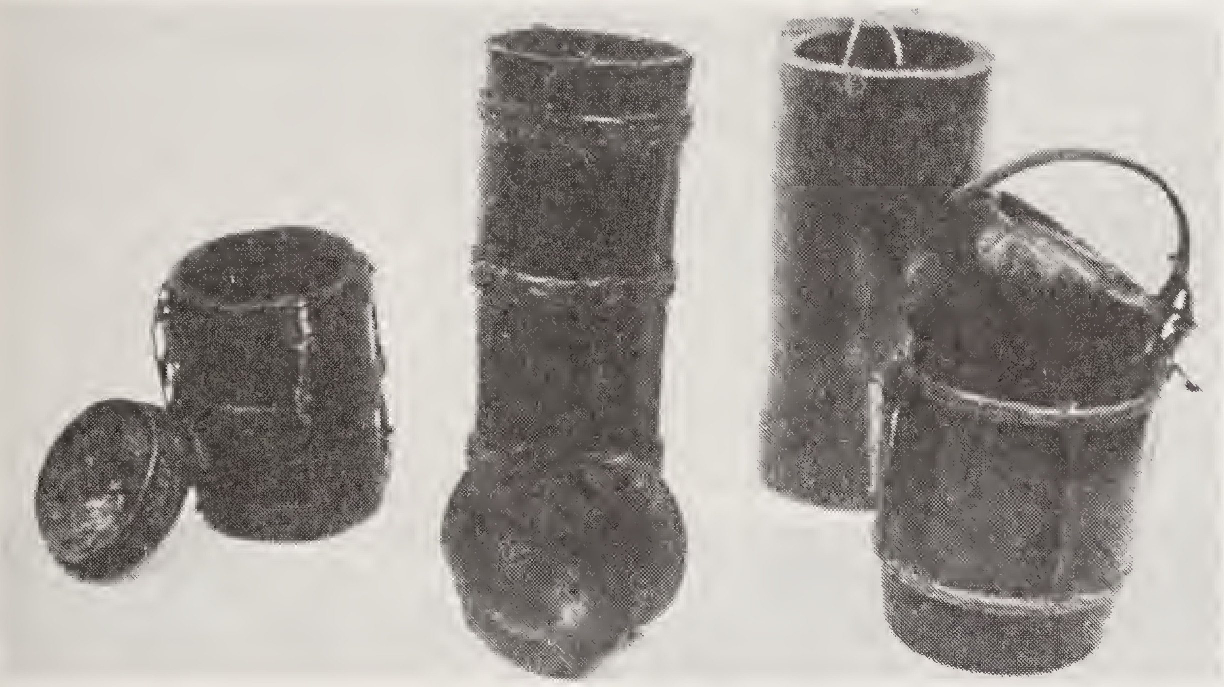
A number of small whole bamboo containers made from small diameter culms were seen in the district museums of Arunachal. Like miniature beer mugs with lids, some of these were only 75 mm high, but beautifully made, complete with fine braided cane straps and rings. These are used as little pouches for tobacco or valuables (figs. 245, 246).

Pabun-Dwije

Pabun-dwije, a bottle-shaped rice beer container, was seen at the Subansiri District Museum at Hopoli, Arunachal. It is made from a young culm segment with a nodal diaphragm forming the base. The outer skin is peeled. A rope is tied around the container near the open end. The culm is then heated and as it softens the rope is tightened, thus forming a neck (fig. 247).

Khachung

Dried gourds are commonly used as containers all over India. The Monpas of Arunachal Pradesh use a gourd with a long narrow neck to carry rice beer to the fields when they go to work (figs. 248, 249). These gourds are covered by a hexagonal net woven with strips of bamboo. The top of the



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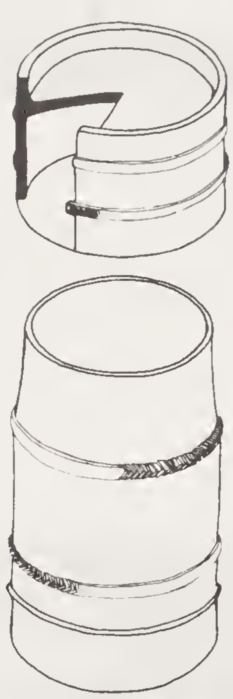

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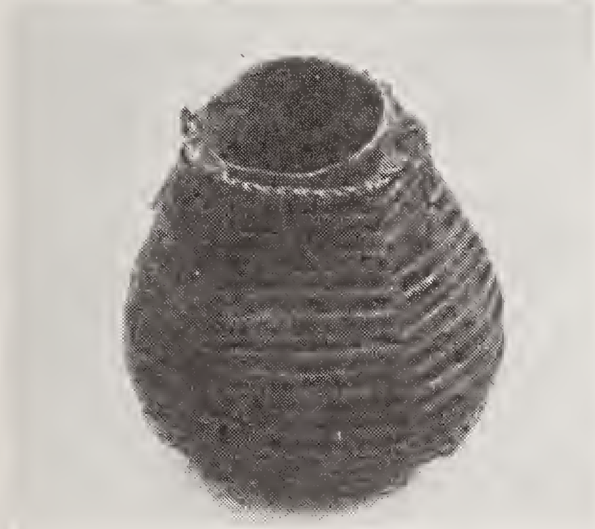

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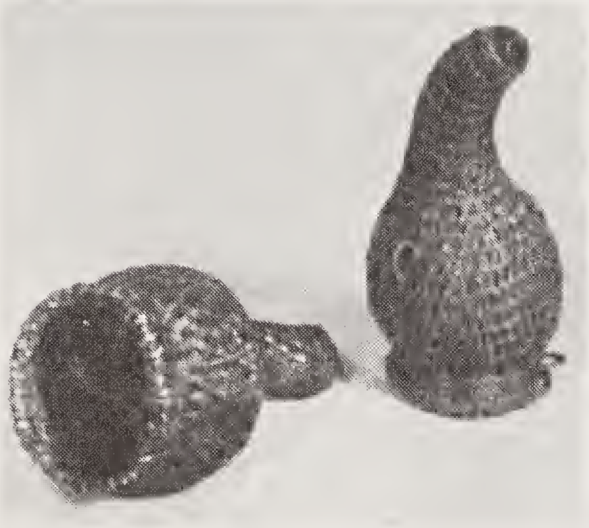

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neck has a hole which is the mouth of the container. A braided cane ring is woven around the mouth. Strips of bamboo are twisted in the centre and folded over strands of the braiding to anchor them to the top of the gourd. Each arm of the folded strip becomes an element that makes up the hexagonal weave, with each arm inclined in opposite directions. Sometimes both arms of the fold move in the same direction. Another bamboo strip spirals around the gourd, interlacing the inclined elements. As the body of the gourd increases in circumference, additional strips of bamboo are hooked onto the spiralling element to fill in the gaps between the original strips to create an evenly-spaced hexagonal net.

At the base a close basket-weave holds the vertical elements tightly just below the gourd so that the latter cannot slip out of the net. The vertical ends are turned to form the core of a circular rim, which is then bound with a strip of bamboo. The gourd rests on this rim thus ensuring that its base is protected. Strips of bamboo passed diametrically across the base rim, below the gourd, ensure that it remains inside the hexagonal net. This net of bamboo around the gourd protects its brittle walls from impact forces.

Upam Raga

A wide slightly pear-shaped gourd used to store liquor by the Hill Miris of Arunachal was seen in the Museum at Hopoli (fig. 250). A thick cane strip is wound round the gourd, forming horizontal strips across it. The strip is looped over six vertical strips of cane distributed around the circumference, so that the gaps formed by the vertical and horizontal strips are of the same width all around the gourd. The width of the gap is equal to that of the strip. Apart from being a strong protective cover, the cane braiding is also elegantly decorative.

243: The *thuppak*, a Nocte rice beer container.

244: The lid of the *thuppak* is attached by a braided cane strap.

245: Small containers used to store tobacco or valuables seen at the museum at Along.

246: A cutaway view showing the construction of the lids of these small containers.

247: The *pabun-dwije*, an Apa Tani rice beer container.

248: The *khachung*, a gourd container used by the Monpas for rice beer.

249: The *khachung* in use.

250: The *upam raga*, a gourd container used by the Hill Miris, seen at the museum at Hopoli.

Baskets

Carrying Baskets

The tribes of the northeastern region use baskets to transport a wide range of goods required for day-to-day living (figs. 251-255). Grain is carried from the fields to the village granaries, firewood is collected for fuel from the forest, water is carried in bamboo tubes placed inside a basket and fish caught from streams are only some of the products carried in baskets. The weekly purchases from the bazaars and cooked food to the fields are also carried in baskets. Some are used exclusively for carrying grass and hay intended as cattlefeed. Occasionally one sees an infant perched on one of these baskets slung across the back. The size and shape of a number of baskets for the same purpose vary, depending on whether they are used by men or women. In the northeastern region the term "carrying basket" is used for an extremely diverse range of products.

Product Diversity

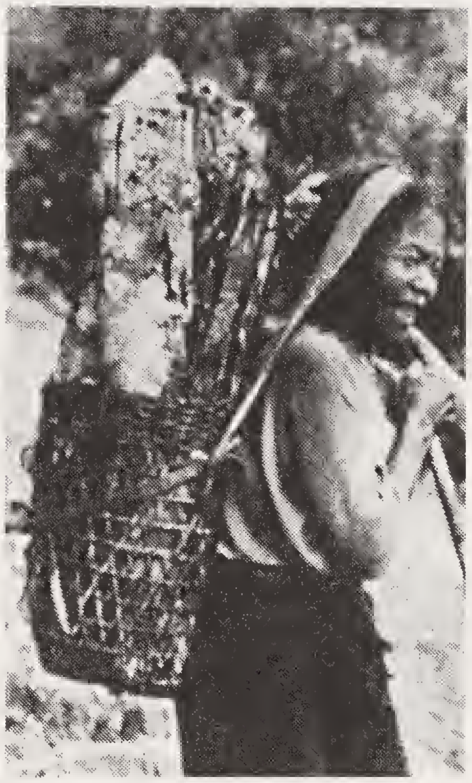
This diversity stems from several influencing factors. They are as follows:

(1) The intended function of the product, i.e., whether the basket is used for the sole purpose of carrying a particular commodity or whether it is a general purpose basket for an assorted range of commodities of different volumes and weights. (2) The mode of carrying these baskets, i.e., whether they are carried in the hand; slung over one shoulder with a strap; slung over the back by two straps resting on the shoulders; hung at the waist by a strap attached to the belt; or slung over the back with a strap over the head. (3) Traditional and cultural differences between ethnic groups. (4) The availability of suitable raw materials as specific species of bamboo and cane are available in abundance in different areas within the region. (5) The different ways in which the technology of working with bamboo and cane are understood by the various groups of people.

The detailing and structural logic seen in these products show a sensitive understanding of the complex interplay of all the above factors. It is obvious that the high level of refinement seen in the products evolved over a very long period of time. There is much that could be learnt about principles of construction as applied to cane and bamboo products by a detailed analysis of these products.

Mode of Carrying

At a very general level of classification one can see two main streams amongst the carrying baskets (fig. 256). One group represents the baskets of the plains settlers which are normally carried by balancing on the top of the head. These baskets are usually wider than they are tall, perhaps to keep the centre of gravity as low as possible. Another method of carrying baskets in the plains is to suspend two of them on a bamboo beam (like a weighing balance), and this beam is supported on one shoulder with the baskets hanging in front and behind the person. The other group represents the baskets used by the various hill tribes, normally carried over the back with a cane, bamboo or fibre strap passing over the head. This mode of carrying has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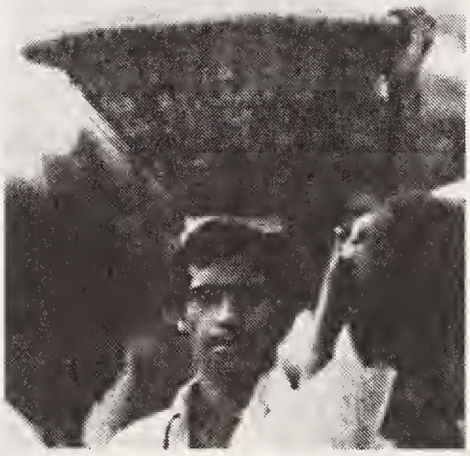
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251: A Tripura Bengali carrying rice for sale at Taliamura bazaar. This mode of carrying is typical for the plains people.

252: A Naga woman carrying firewood.

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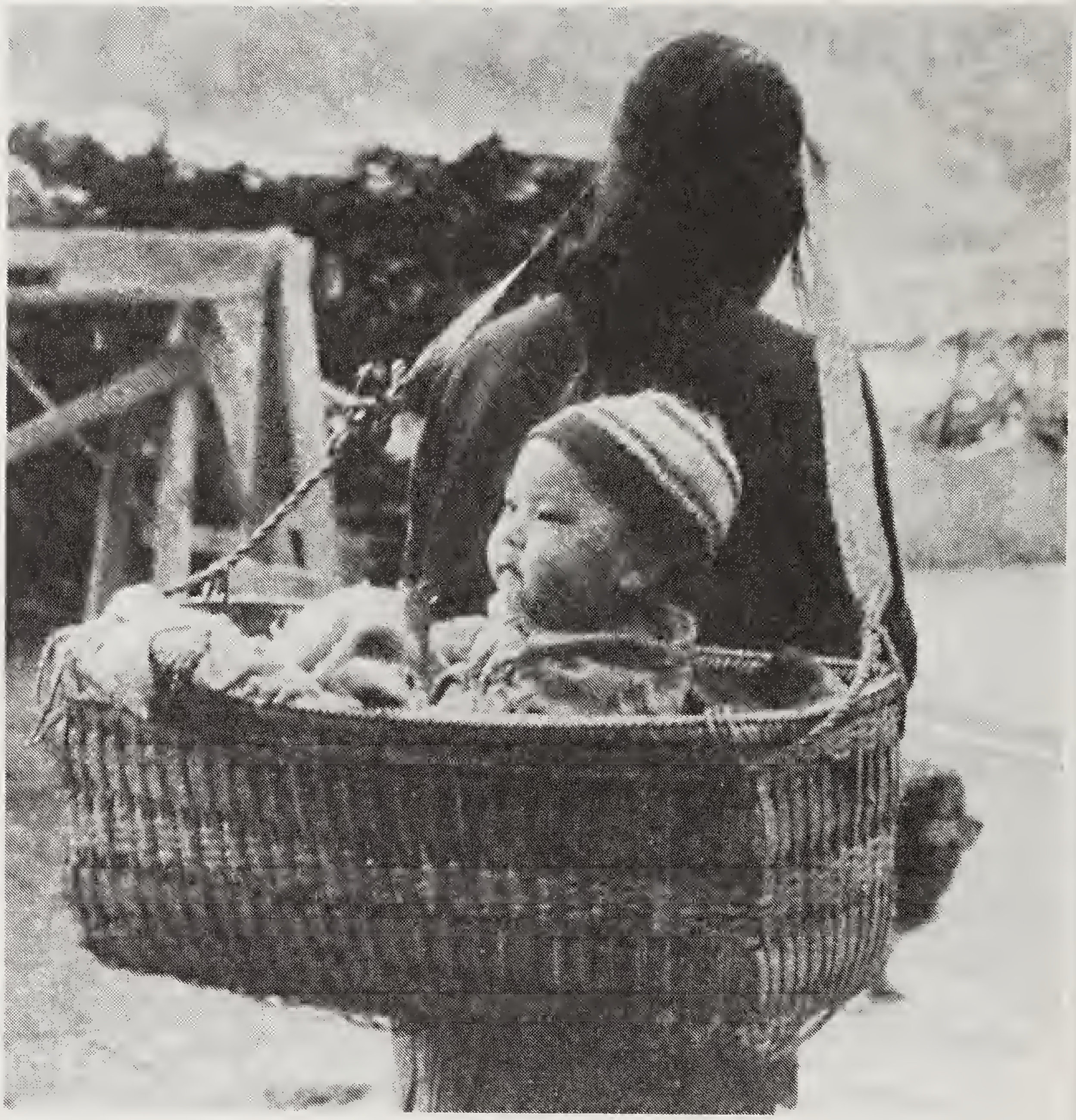

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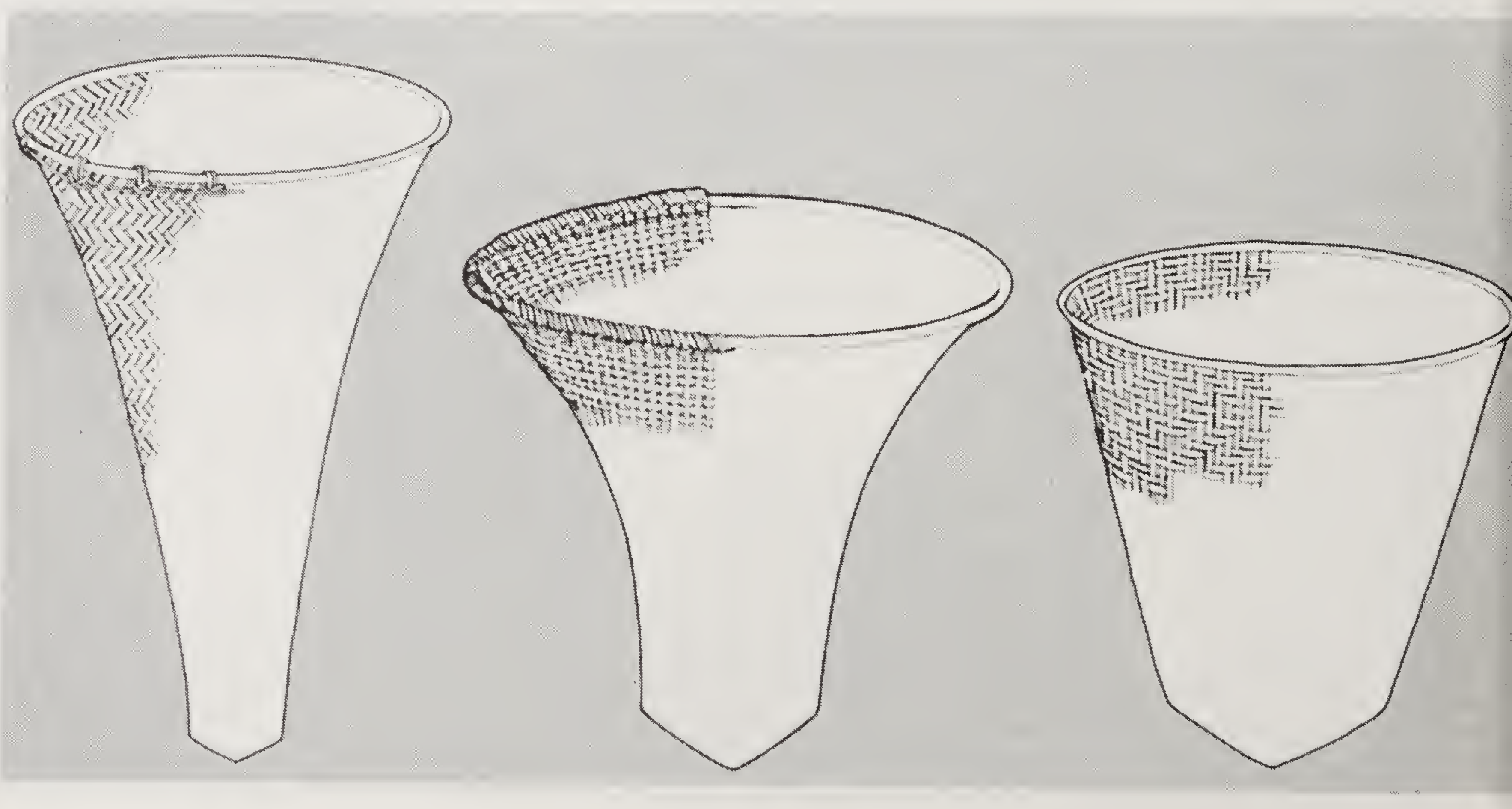

obviously developed from the need to keep one's hands free for climbing steep hill slopes while the body is inclined forward to counter the load at the back. The height of these baskets is generally greater than their diameter.

Shape and Construction

All these baskets follow one construction principle, with only a few exceptions. The principle used is that the baskets start from a square base leading upto a circular rim. The proportion between the size of the square base and circular rim varies from basket to basket (fig. 257). The square base seems to be a direct outcome of the method of construction employed in converting cane or bamboo splits into three-dimensional forms. The square results from the base being made by inter-weaving sets of strips at right angles to each other before these strips are turned upwards to form the sides of the basket.

This square may be formed by the weave elements being either parallel to the sides of the square (fig. 258) or parallel to the diagonals of the square (fig. 259). When the square base is made up of diagonal elements the side walls also continue in the same weave, so that on the sides the elements cannot be truly described as being warp and weft as both move diagonally across the face of the basket. There are two exceptions to this method of forming the base. The first is when a hexagonal weave is used, resulting in a polygonal base, some of these tending to be circular (fig. 260). The other version is when the warp elements are assembled radiating from the centre of the base and moving vertically up the sides of the basket with the weft element weaving through these to form a growing spiral (fig. 261). This construction results in a base terminating in a point which does not permit the basket to rest flat on the ground except when this point has been pushed in upwards to generate a concave surface at the bottom of the basket.

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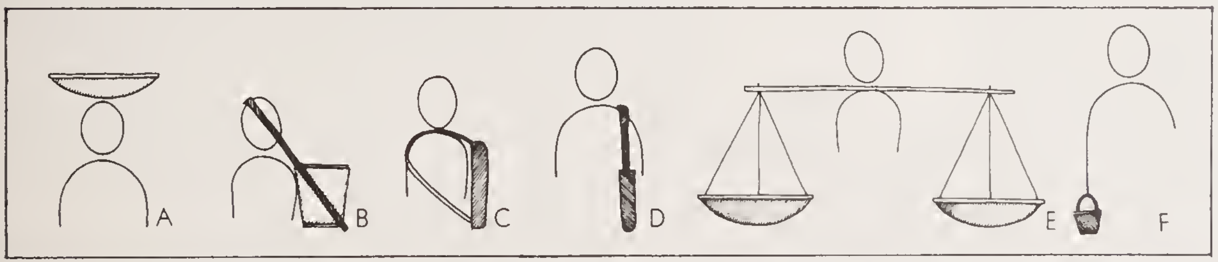
253: An Adi Gallong farmer and his son carrying grain.

254: A Dimasa Cachari man carrying a basket made of cane.

255: A Nepali mother carrying her baby.

256: The different modes of carrying baskets: (A) on the head; (B) with a head strap; (C) on the back; (D) over the shoulder; (E) on a shoulder beam; and (F) in the hand.

257: With varying proportions, the baskets start with a square base and end in a circular rim.



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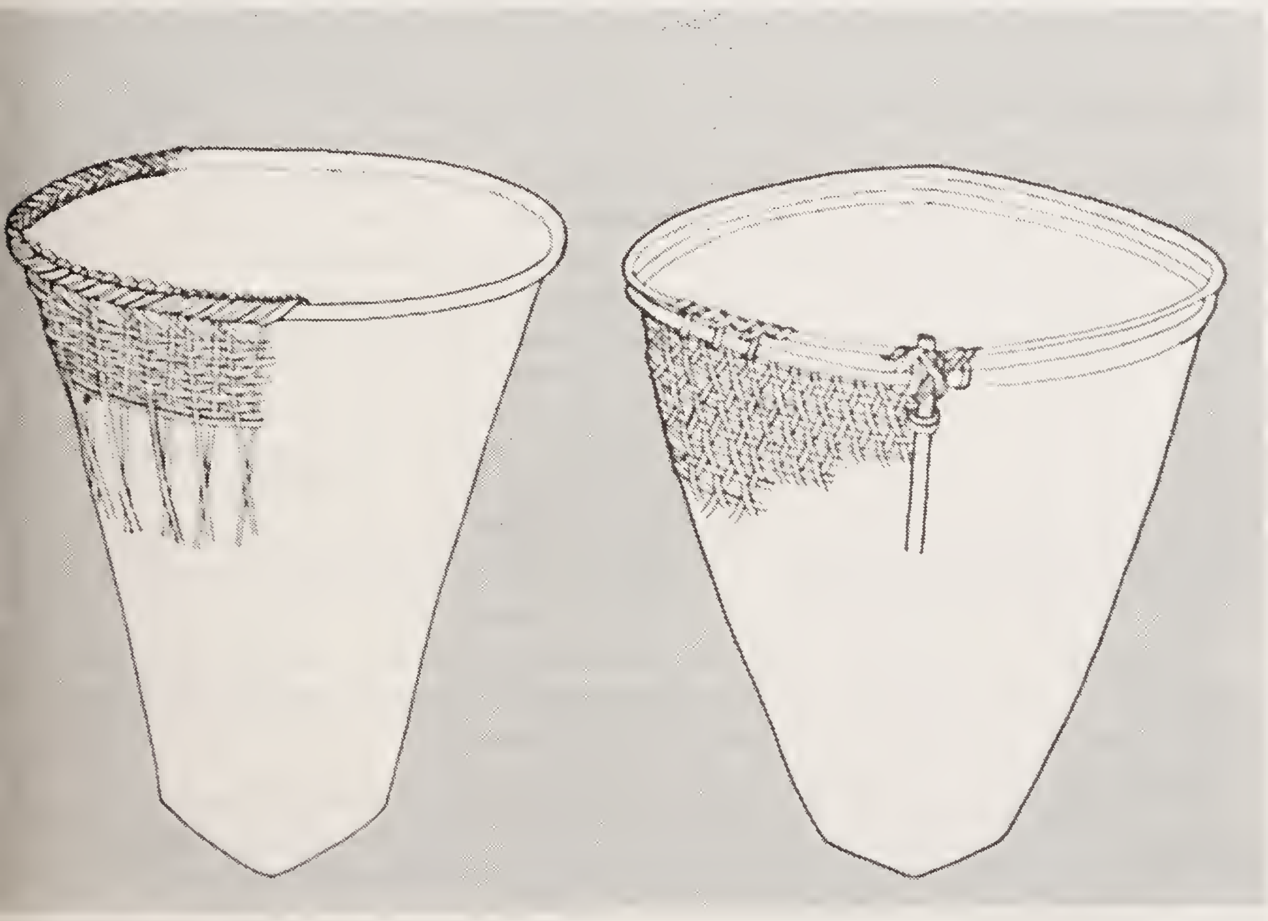

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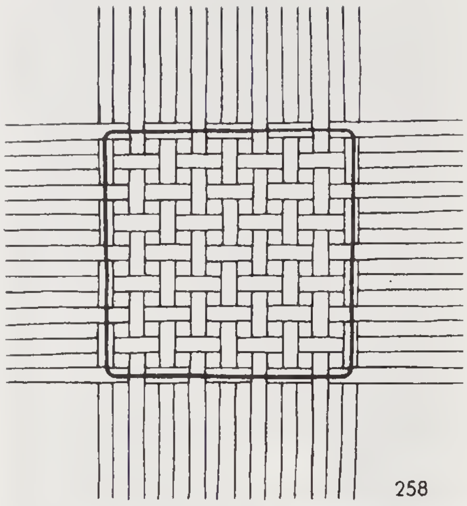
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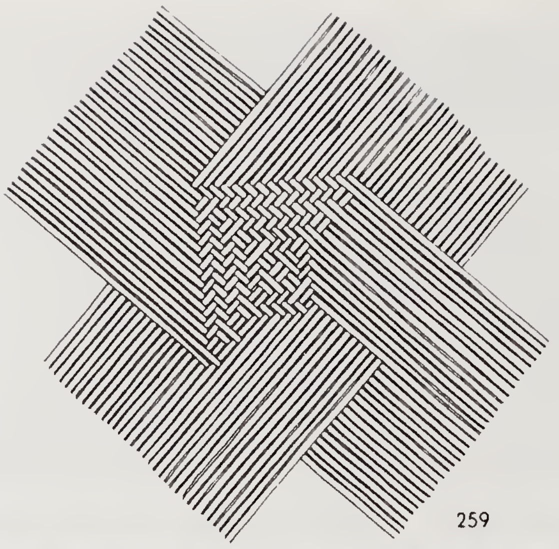
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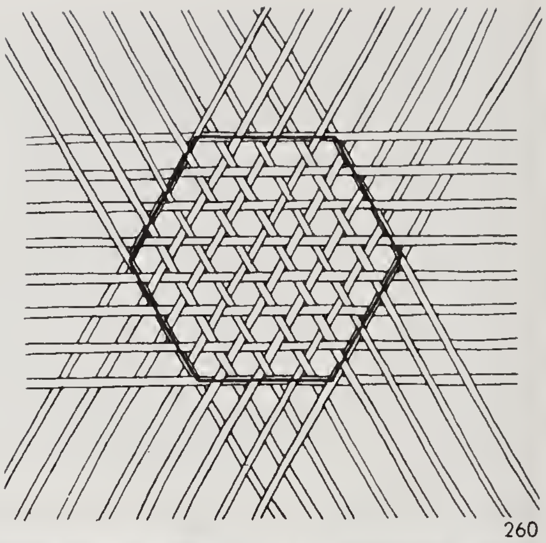
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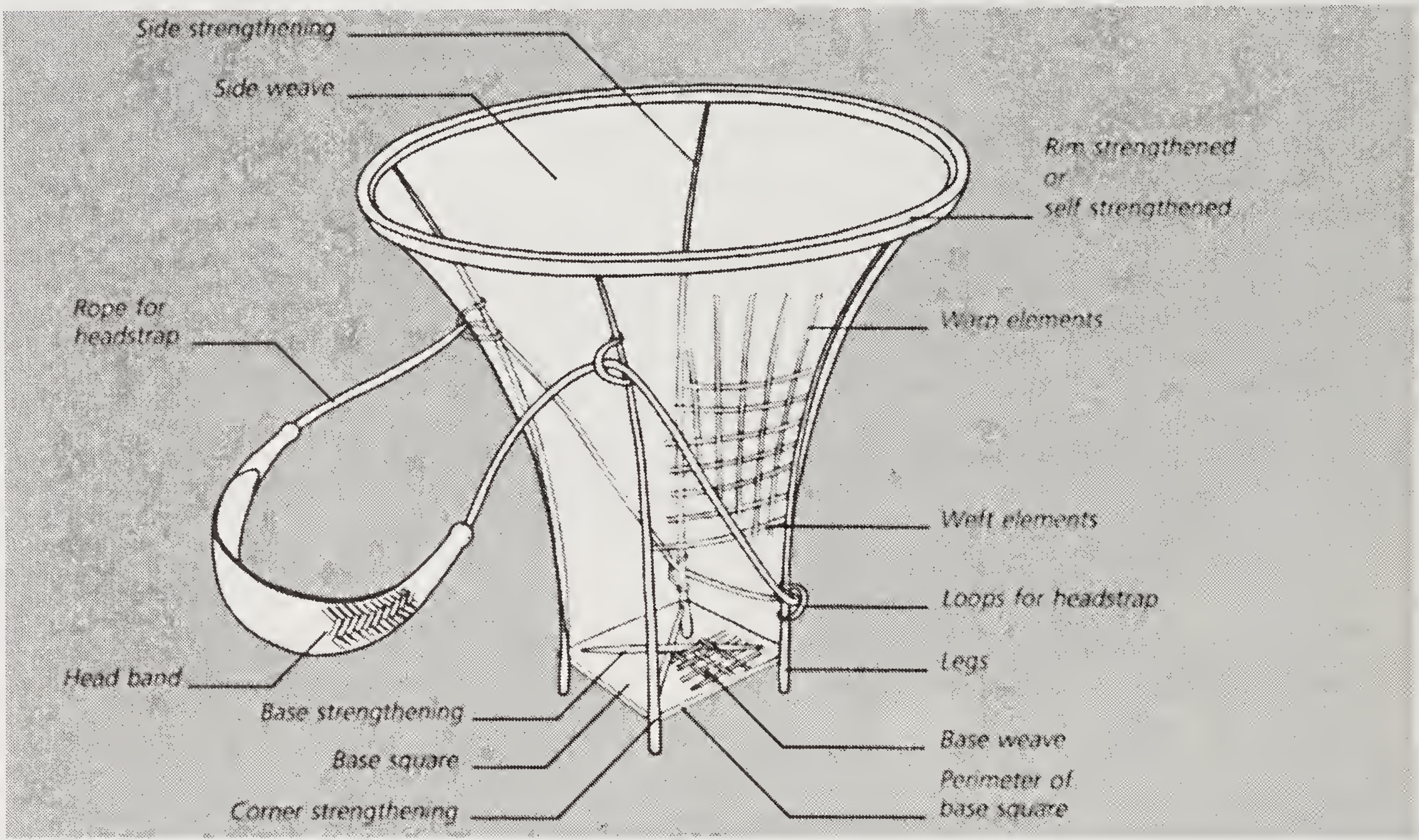

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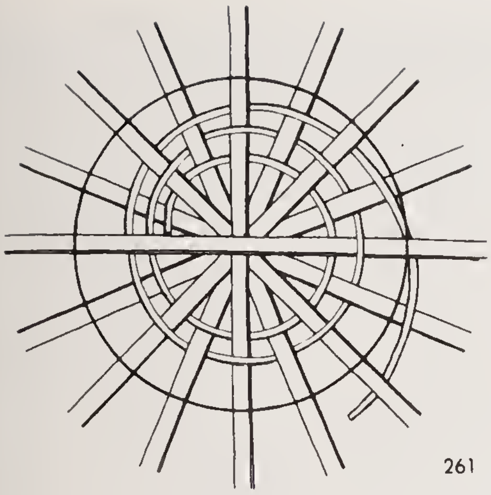
Base and Side Weaves

The sides of these baskets are made using a choice of several weaves depending on whether an open or closed structure is desired, a factor dictated by the intended function of the product and its strength requirements (fig. 262). With a woven square used in the base the choice of weaves used in the sides of the basket may be an open hexagonal weave where two sets of warp elements weave diagonally across the face of the basket forming a rhombic structure while one horizontal element spiralling upwards weaves into the rhombic structure to generate open hexagons and small triangles. When a closed or densely-packed surface is required, variations of the twill weave are used or combinations of tabby and twill weaves are employed. In many cases conscious decorative weave structures are worked into the side weave.

When the base is woven in a hexagonal weave, it is invariably extended upwards to form the sides with the appearance of the inevitable pentagons at the joining line of the base and side of the basket.

When the base is made of radiating warp elements, a spiralling weft is used for both the base and sides of the baskets. Here the weave could be made of a single-start spiral or a multiple-start spiral which weaves to form either a tabby or twill structure. Some structures involve the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twisting of a pair of weft elements after weaving over and under a given warp element. This is known as pairing. These structures too result in a closed, densely-packed weave, predominantly used for the shallow baskets from other parts of India. However, in the Northeast this is rarely seen.

258: The square base with the elements parallel to the sides.

259: The square base with the elements parallel to the diagonals.

260: The polygonal base with the elements forming hexagons.

261: The circular base with the elements arranged radially.

262: A diagram explaining the terminology used in relation to the construction of the baskets.

Side-Strengthening

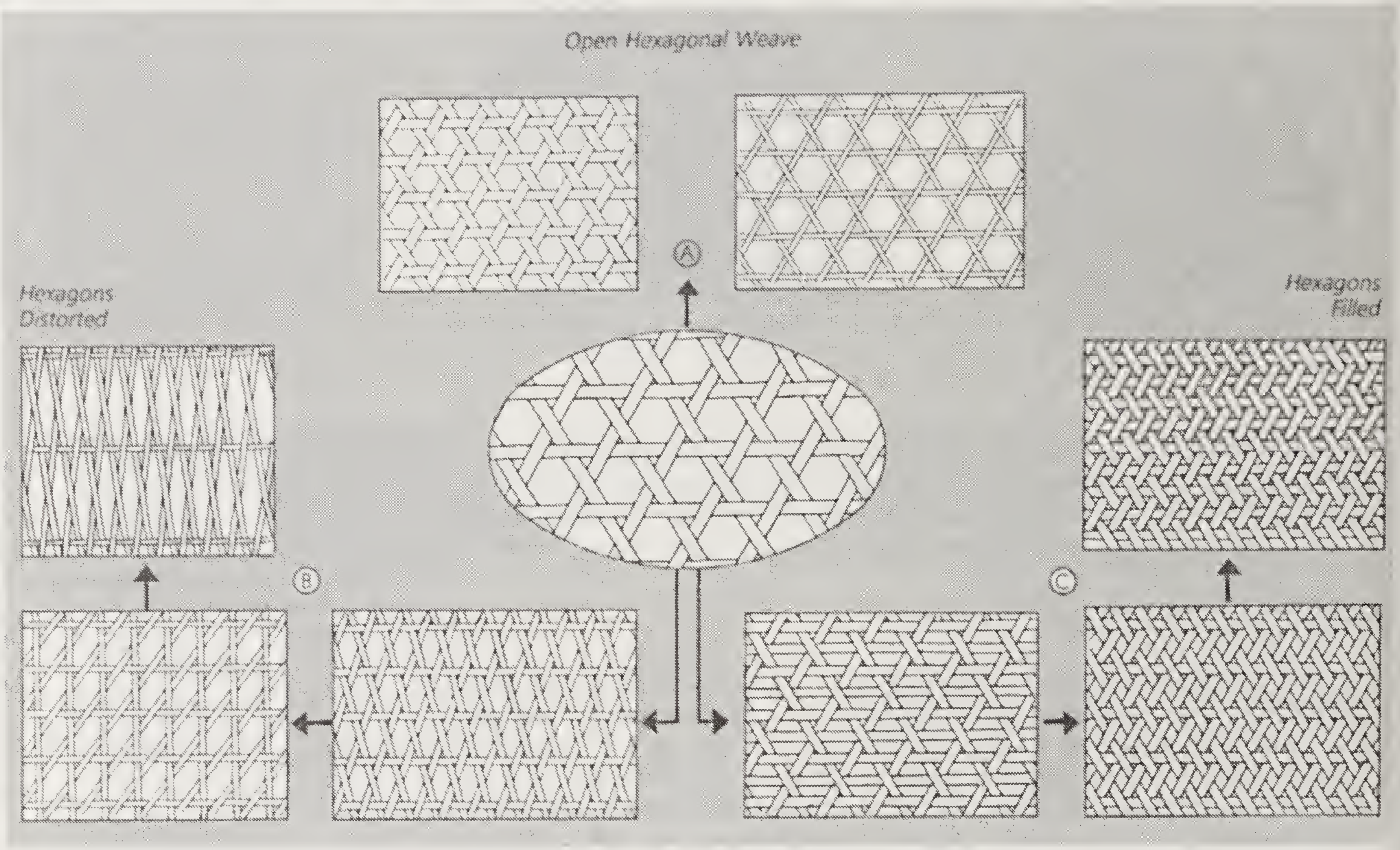
In several baskets the side walls are made rigid to hold vertical loads. This additional strengthening is achieved by selectively weaving fairly thick splits parallel to the warp. These are normally located vertically at the corners when the base is square. Side-strengthening members are also used in conical and circular baskets, when they are uniformly distributed around the circumference of the basket. A few hill tribes make the side walls of their baskets flexible by providing a slit down one side. These baskets are used for carrying firewood. After firewood is placed vertically inside the basket a rope is tightened around it so that the slit parts overlap to hold the load firmly.

Rim Construction

All these baskets terminate in a clearly-defined rim which has been suitably constructed. A great many variations in rim construction can be seen, but two basic types are generally used. The first is what may be termed "self-strengthened rims" where generally the warp elements of the basket are further split and woven horizontally to form one or more strong bands. The second is when additional rings of cane or thick bamboo splits are bound firmly, both on the inside and outside of the basket, using split-cane binding. The side wall of the basket is hence sandwiched between one or more sets of rings. This type may be termed as "strengthened rims". The binding detail varies from basket to basket and from tribe to tribe. However, a few simple binding details are found in common. In some cases the binding details take on a decorative role, over and above the structural.

Other Details

Other interesting details of these baskets are the manner in which corners of the square-based baskets are strengthened with additional cane binding which invariably has a decorative quality. Handles provided to pick up and carry some baskets and loops made of cane binding to receive the head or shoulder straps exhibit a wide range of interesting constructions. In several cases the bases are strengthened by fairly stout bamboo splits inserted into the weave. Some baskets are provided with legs of whole or split bamboo, extending below the corners of the square base. These normally extend upwards to strengthen the sides of the basket. Base strengthening is, in some cases, achieved by attaching bands or rings of cane, bamboo or wood around the sides of the square base.



263: Variations in the hexagonal weave are evolved by: (A) changing the width of the elements; (B) by changing their inclination; or (C) by adding elements in one, two or three directions.

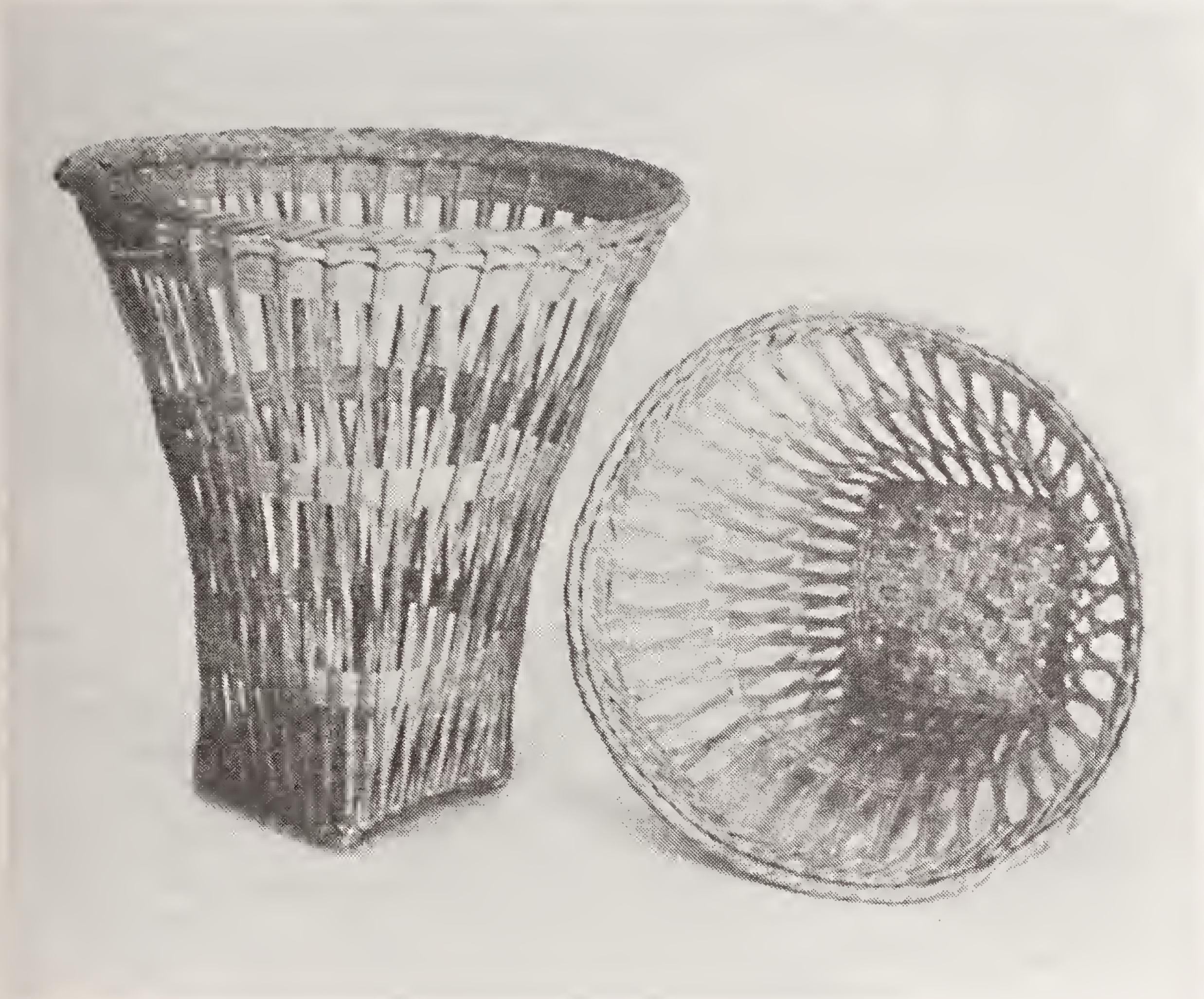
Open-Weave Carrying Baskets

Several baskets made in the northeastern region employ the open-hexagonal weave in their construction. The hexagonal weave is used because it is the most economical way of generating a strong surface, i.e., with the use of minimum material leaving relatively large open spaces. As mentioned earlier, these could either have a square base, made up of elements woven at right angles to each other or a polygonal base made in an open-hexagonal weave.

Weave Structure

In both cases the sides of the basket are made up of two sets of elements extending out of the base where one set moves up the side inclined in the clockwise direction with the other set inclined in the opposite direction. These two sets do not interweave, but form two separate layers, one on the inside surface of the basket and the other on the outer surface.

The interweaving is done by a horizontal element or elements that weave into the rhombic pattern generated by the overlapping sets of inclined elements. These horizontals may be separate co-axial rings or a continuous upward spiralling element which weaves into the rhombic structure. This interweaving is achieved by the horizontal element always passing under the inclined elements forming the inner layer and over the inclined elements forming the outer layer, as the basket is viewed from the outside. Hence the two inclined layers are effectively interlinked. Variations in the basic hexagonal weave pattern are obtained by (A) changing the ratio between the elements and the spaces between them; (B) by changing the inclination of the warp elements; and (C) by introducing additional elements parallel to the basic elements of the hexagon (fig. 263).



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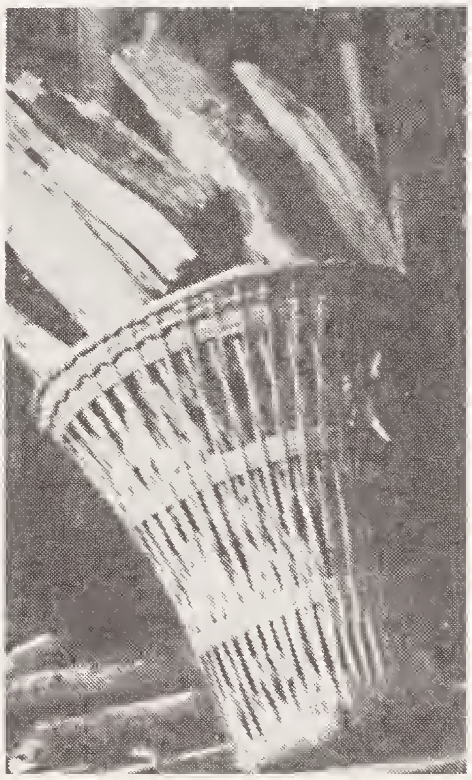
264: The *paikawng*, made by the Lushai tribe of Mizoram.

265: The *paikawng* loaded with firewood.



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Weave Variations

A variation of this hexagonal weave effectively reduces the open areas in the weave by the introduction of an additional space filling element. This additional element is horizontal and is held passively between sets of inclined elements, that is, between the two layers. This space-filling element lies in the gap between rows of horizontal binding elements, and passes through the centre of horizontal rows of hexagons. The element divides the hexagons into two small and symmetrically opposed trapeziums. The desired size of the trapezium is achieved by varying the width of the space-filling element.

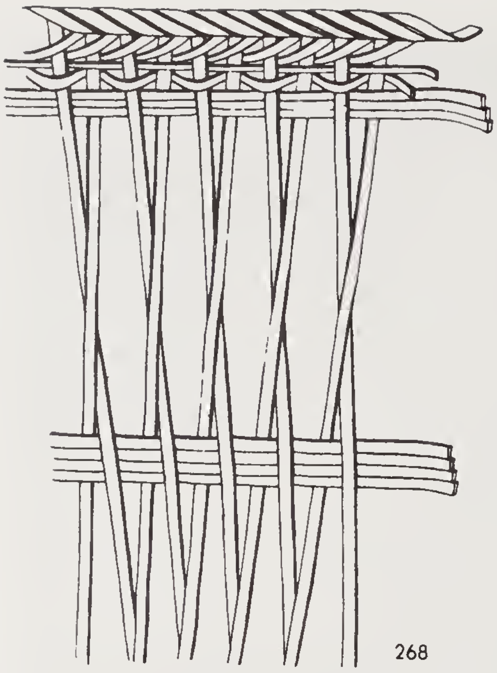
Other variations are generated by introducing additional space filling elements into the remaining diagonals of the hexagons. If a pair of diagonals are filled, the result is the division of the hexagon into triangles and rhombii. When all three diagonals are filled, the hexagon is broken down into small triangles.

Weave Stresses

If the horizontal element is thicker or stronger than the inclined elements then the stress deflection in the horizontal element is almost imperceptible whereas the inclined elements go into a series of undulations as they are forced above or below the horizontal element respectively. When the horizontal element is weaker than the inclined elements, it is bent sharply back and forth as it weaves through the sets. When all three sets are of uniform thickness the deflection is apparent in all the elements.

Paikawng

The *paikawng* is an open-weave carrying basket made and used by the Lushai tribe of Mizoram (fig. 264). This basket is generally used by women as a rough work basket for carrying firewood, bamboo water tubes, etc. (figs. 265, 266). The basket, made entirely of bamboo outer splits, is carried over the back with a strap resting on the head. The local names of the bamboo



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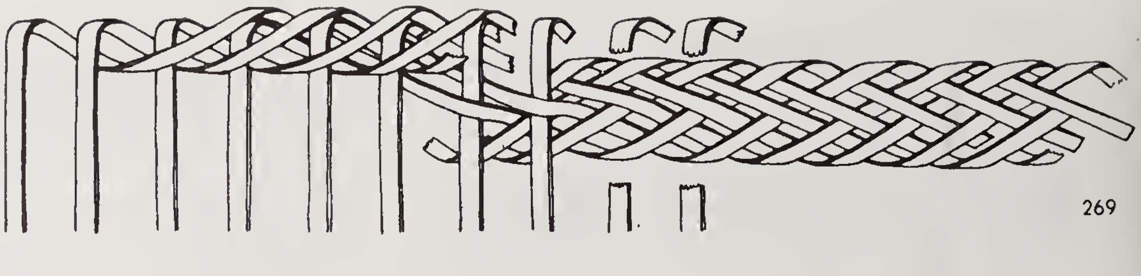

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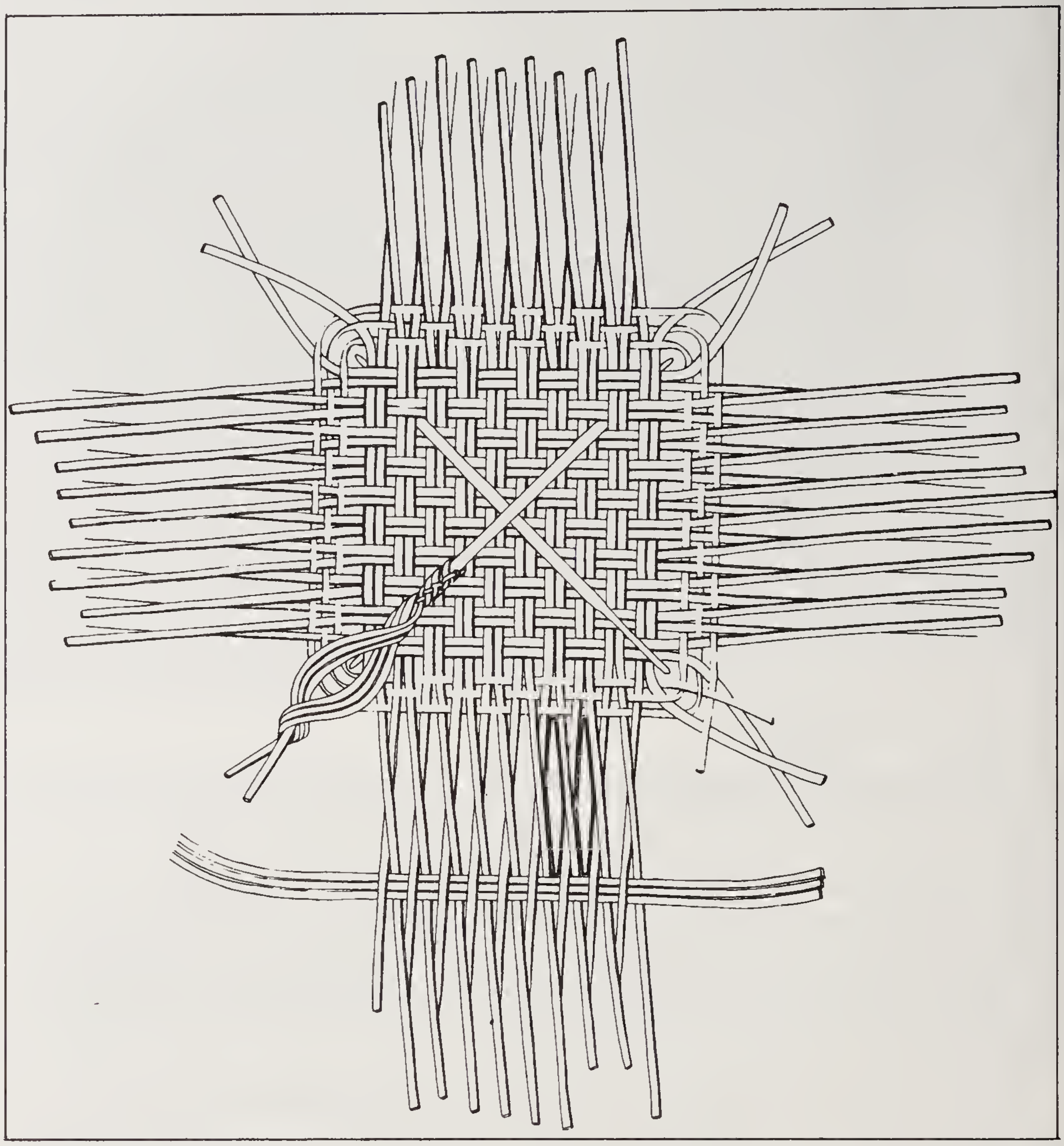

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species normally used are *rawnal, rawthing* or *phulrua.* The basket has an extremely strong construction which is very resistant to vertical loads. This is due to the construction pattern as well as the fact that fairly thick strips of bamboo are used.

Size and Shape

The *paikawng* has a square base of diagonal 230 mm from where it gradually transforms into a circle of diameter 390 mm at the rim. The height of the basket is 390 mm. To the craftsmen making this basket, the height is assumed to be one hand-measure known as *tawngkhat* in Lushai.

Base Weave

The main elements are those that form the base, sides and rim of the basket. These interweave to form the base and extend up on both sides upto the rim. Hence these elements are very long. They are approximately 7 mm wide, 3 mm thick, and 40 such elements are used in the basket. The edges of all the elements are carefully rounded to give them a soft finish. In the square base these elements are taken in pairs, 10 in one direction and 10 other pairs weaving at right angles to the former in a simple basket weave (fig. 267).

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The thickness of each element is reduced at the centre so that at the base their thickness is less than at the sides of the basket. The width of these elements remains constant. The woven base square is strengthened by two stout splints of bamboo which are introduced into the weave structure along both diagonals of the square. The elements extending outside the woven base square are turned up to form the sides of the basket. Around the perimeter of the base an additional element is woven so as to move around the base square alternately above and below pairs of elements extending outside the base. This element, which goes through five or six turns, forces the main elements into a vertical orientation.

266: Cotton stored in the *paikawng*.

267: A diagram showing the base weave, the base strengthening diagonals and the corner strengthening binding.

268: The side weave near the rim.

269: A cutaway diagram of the self-strengthened rim.

Side Weave

These vertical, parallel elements are then formed into a rhombic configuration by pushing aside and inclining individual elements in each pair in opposite directions so that one set is forced on top of the other. This forms the basis for interlacing with a horizontal element to form the open-hexagonal weave. In the *paikawng* these hexagons are extremely elongated vertically as the two sets of inclined elements are tilted away from the vertical at a very small angle. This also ensures that three rows of hexagons are sufficient to achieve the height of the basket. Each row of hexagons is progressively taller and wider to allow for the enlarged diameter at the top of the basket. The number of hexagons in each row is the same, as no additional vertical element is added. The horizontal elements appear in the form of three separate co-axial rings defining each row of hexagons. Each ring is a tight spiral of three to four turns made of bamboo splits slightly smaller in cross-section than the main elements.

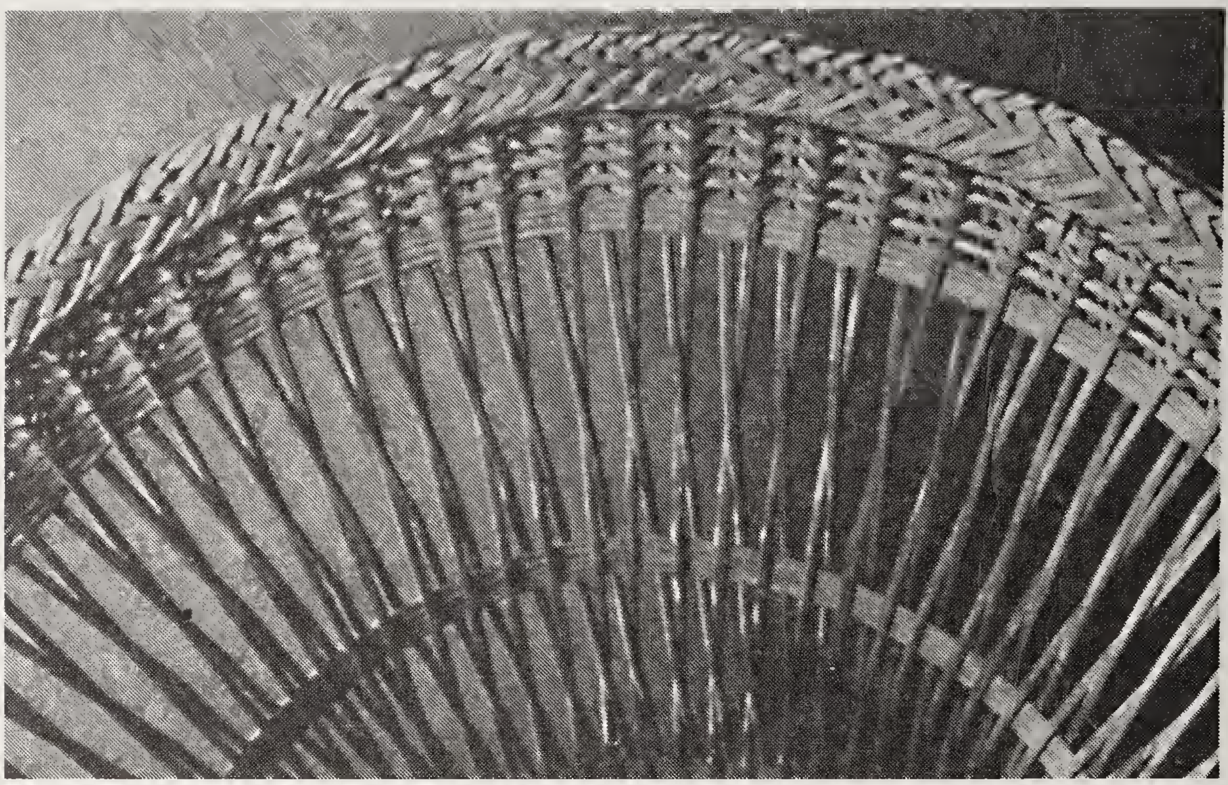
Above the third horizontal band a thinned horizontal element is woven into the verticals so as to move under the outer layer and over the inner layer alternatively. Above this, one more stiff horizontal member is introduced between the two vertical layers. This horizontal goes through only one turn with both its ends being tapered and overlapped (fig. 268).

Self-Strengthened Rim

The twisted and braided self-strengthened rim commences immediately above this ring. At the rim the inclined elements are thinned down keeping their width constant. Here the inner layer of the split is cut and removed, and the outer skin is made more flexible by tangential splitting. These splits are twisted into a helical pattern around the rim before these ends are taken into the inner surface of the basket to be braided as a band around the circumference (fig. 269). This particular rim is called *vawkpuidang phiar* in Lushai. *Vawkpui* means "pig or sow", *dang* means "palate" and *phiar* means "to knit"; hence the rim is said to be "knitted like the palate of a pig". The hexagonal weaving pattern is called *bawmrangkalh,* with *bawmrang* meaning "rough basket" and *kalh* meaning "cross".

270: The *emsin*, an ornamental version of the *paikawng*.

271: A detail of the rim as seen from inside.



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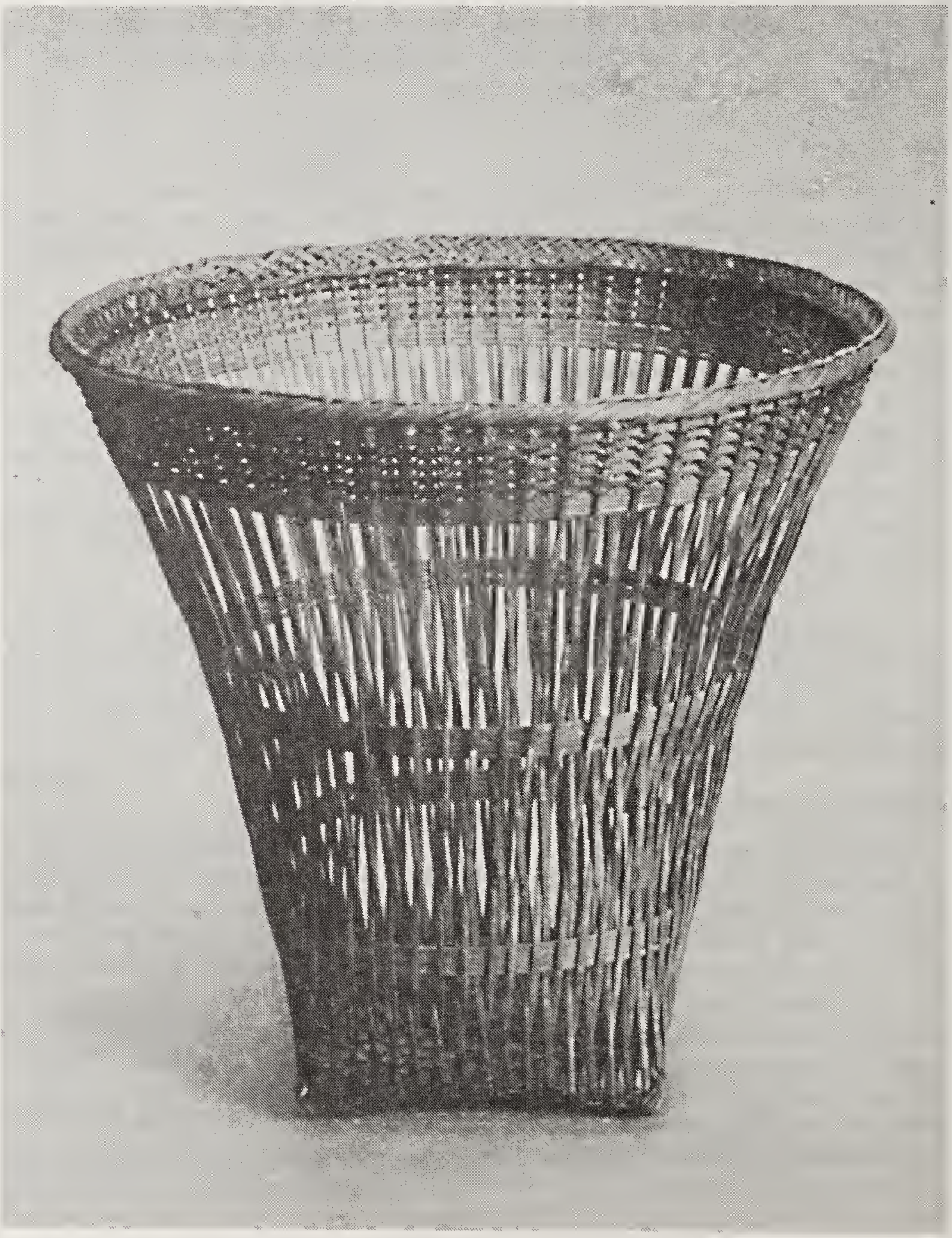

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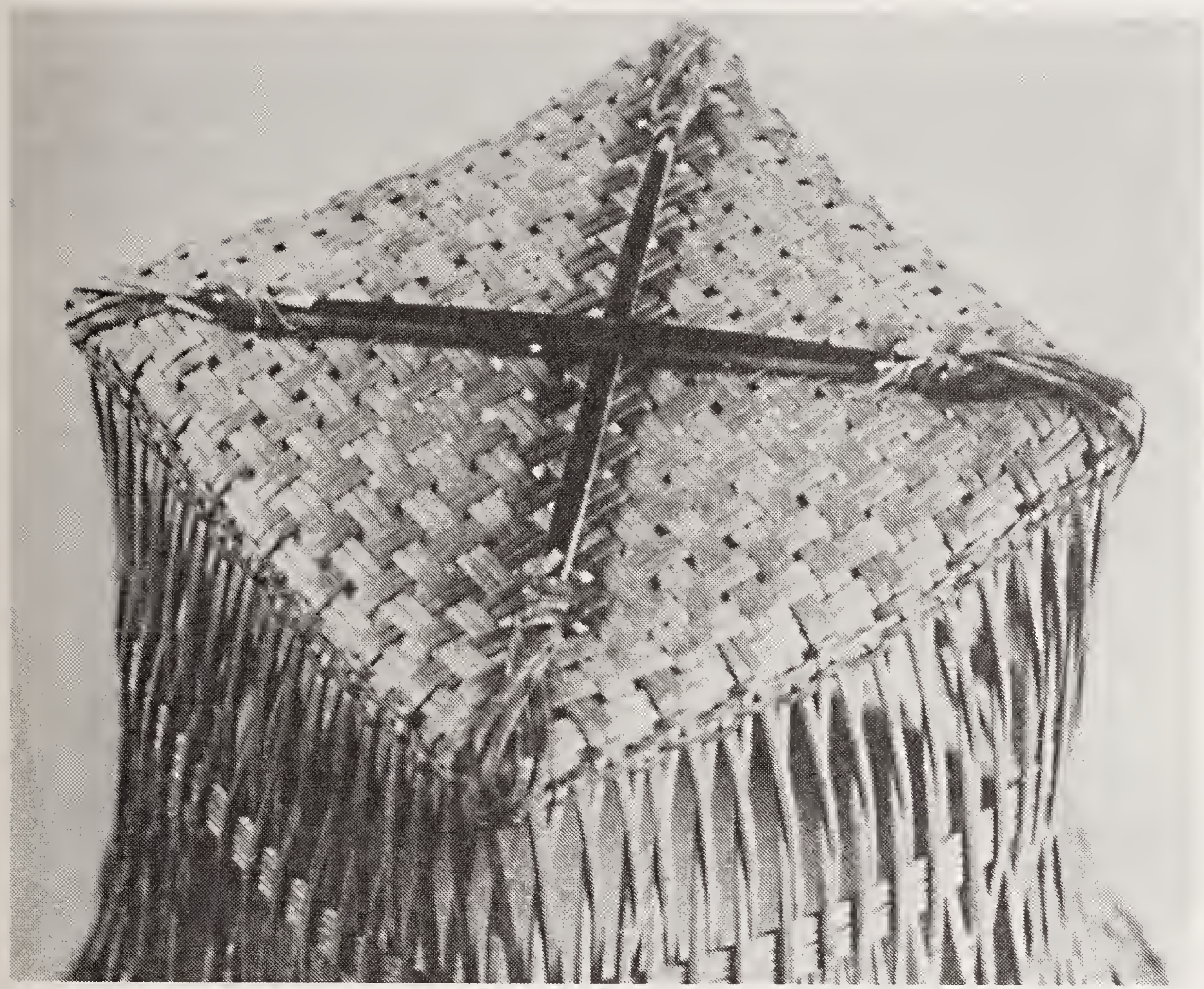


272: The base of the *emsin*.

Corner-Strengthening

The corners of the square base are strengthened with a very interesting binding detail. The binding is done between the two side elements coming out of each corner of the square and the corresponding diagonal braces used to strengthen the base so that the binding passes over the corners to prevent damage to the main structural elements through friction. Only the binding has to be replaced after much use, hence this prolongs the effective life of the basket. The basket is carried by means of a braided head-strap.

Emsin

The *emsin* is very similar in construction to the *paikawng*. In fact it is an ornamental version of the work basket (fig. 270). Lushai women use this basket for marketing or carrying belongings to the fields. It is used for light work. Young girls take pride in taking this basket on evening walks to the bazaar even if there is nothing special to be carried! It is carried over the back with a strap resting on the head.

Size and Structure

The *emsin* has a square base whose diagonal measures 225 mm, the rim diameter is 370 mm and the height is 370 mm. The main elements are about one-third the width and thickness of those in the *paikawng* but more elements are used. The base and sides of the *emsin* are made up of 72 elements with 18 pairs of elements weaving in perpendicular directions at the base.

The rest of the structure is similar to that of the *paikawng* except at the rim, i.e., between the twisted braided rim and third and main horizontal element. Here instead of one row each of thin and stiff elements, five rows of thin and stiff elements appear alternately before the verticals are twisted and braided to form the rim (fig. 271). The main elements and the stiff horizontal elements are made from bamboo outer splits while the thin horizontals below the rim and the spiral elements around the perimeter of the square base and corner binding details are made from cane splits which have been smoked to a rich red-brown colour prior to weaving (fig. 272).

Jamatia Firewood Basket

This basket is used by the Jamatia tribe of Tripura for carrying firewood (fig. 273). It is made entirely of bamboo outer splits, about 7 mm wide and 1.5 mm thick. The basket has a square base of diagonal 330 mm, rim diameter of 390 mm and a height of 540 mm. Above the square base the sides narrow down slightly into a waist before flaring outward to the rim.

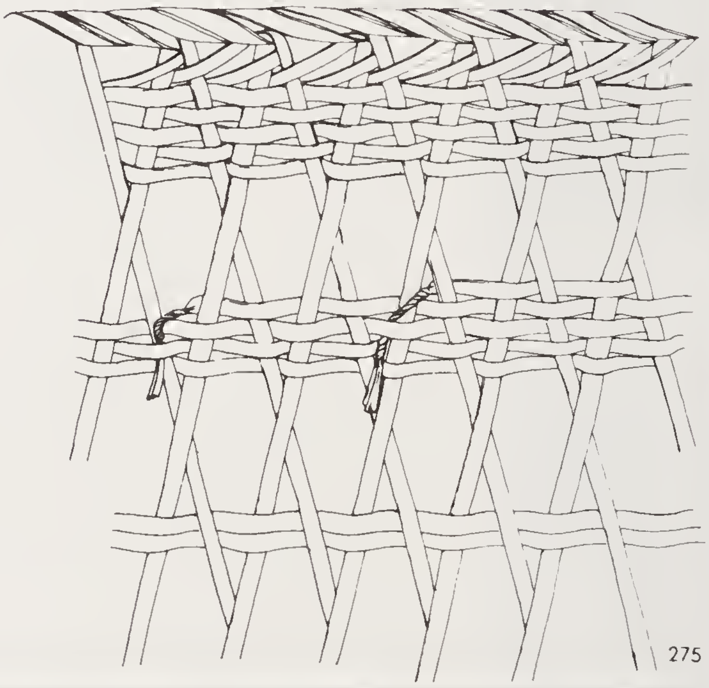
Structure

The construction principle is similar to that of the *paikawng* and the structure of the self-strengthened rim is identical. The sides, in an open-hexagonal weave, have their inclined elements tilting away from the vertical at a greater angle. Hence, the hexagons formed are shorter and more rows are needed to build up the required height (fig. 274). Shorter hexagons are appropriate here as the thickness of individual elements is much less. An interesting detail in this basket is the manner in which loose ends of horizontal elements (those spiralling around the square base) are twisted into a fibrous rope before being tucked back, to lock into the weave (fig. 275).

273: The Jamatia firewood basket.

274: The rim and side weave of the basket.

275: The ends of the weft elements are twisted and tucked into the weave.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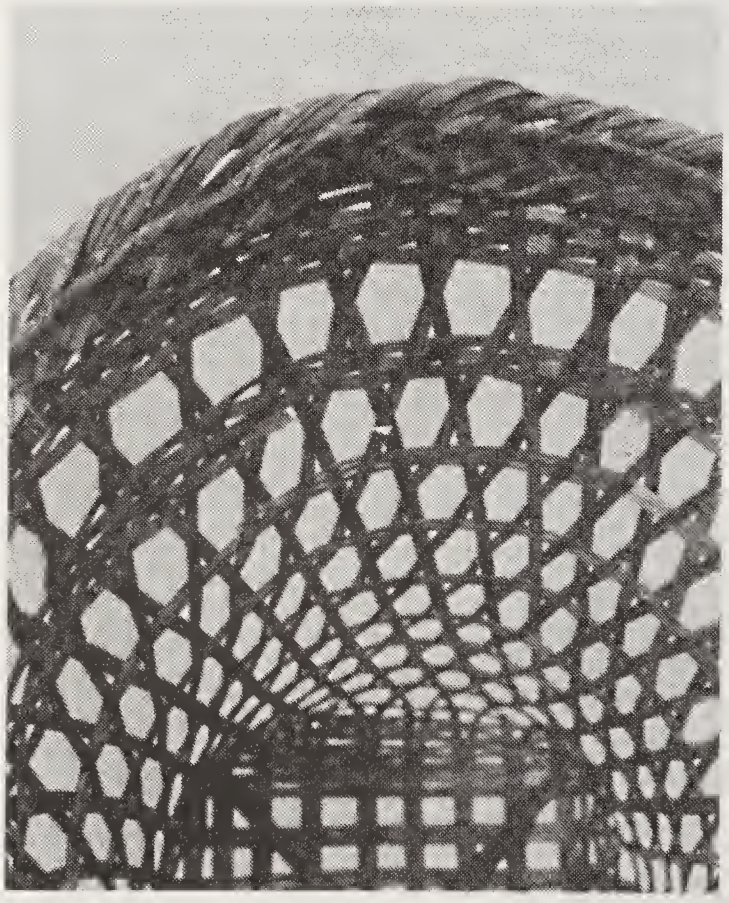
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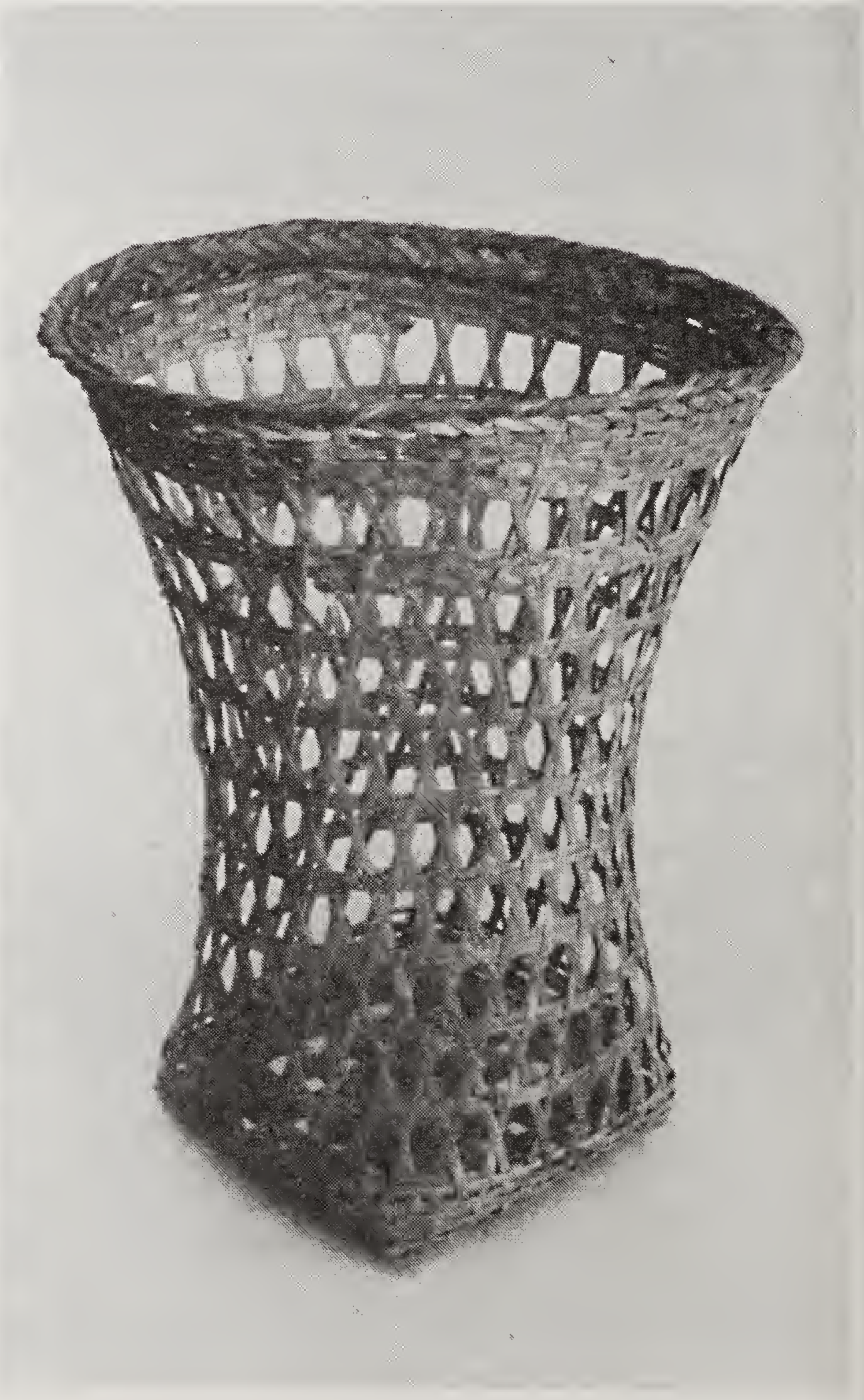
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Kophi

The Angami Nagas of Khonoma village in Nagaland make a carrying basket that is unique in form, quality of craftsmanship and method of construction (figs. 276, 277). The *kophi* is made with great care as it has a social significance beyond its function. It is given to a woman by a man as a symbol of his commitment to marry her.

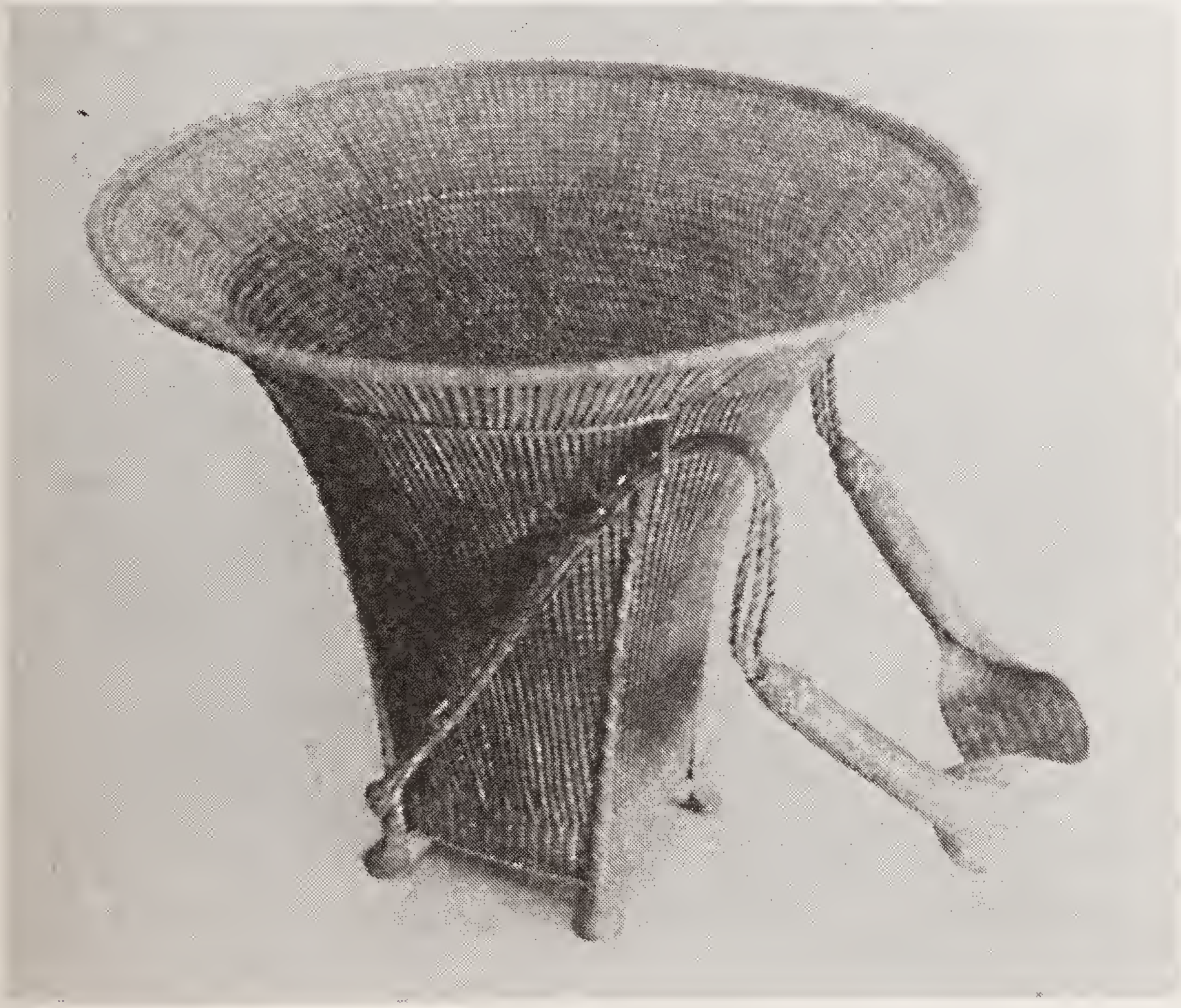
Size and Shape

The basket has a square base and circular rim (fig. 278). The profile runs almost vertically from a narrow base, 160 mm square, before flaring out in a curve into a side rim of diameter 480 mm. Four strengthening elements go down the side of the basket which stands 440 mm high, to end at each corner of the base in a round shoe-like form on which the basket stands. It is made almost entirely of cane strips, with the exception of the strengthening elements which are made from bamboo.

Base and Side Weave

The base of the basket is woven first, after which the form is controlled by weaving the body over a bamboo mould. The body is woven with three layers of elements. All the elements that are extensions of the base are divided into two sets, each alternate strip being bent slightly to create two layers of warp elements. Corresponding elements from each layer describe a shallow angle from the vertical, so that a rhombic pattern is produced.

A strip of cane spirals around the basket, forming the third layer between the two warp layers. Another cane strip is interwoven between the elements of the two warp layers tying them together. This strip forms alternate horizontal bands with the previous spiral. As the basket flares outwards, additional cane strips are added in the warp to maintain an even distance between adjacent strips (fig. 279). These strips are folded in half along the length and hooked into the passive horizontal band before the arms of the folded element fill in the vertical gap in both warp layers. The lengths of the additional strips get shorter as they are introduced nearer the rim.



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276: The *kophi*, an Angami Naga basket.

277: An Angami mother and child carrying *kophis*.

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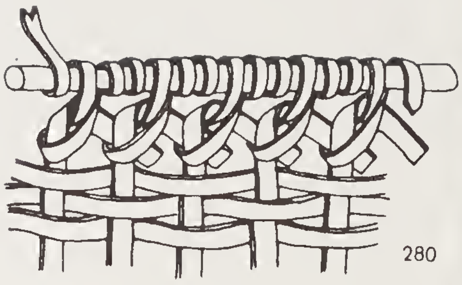

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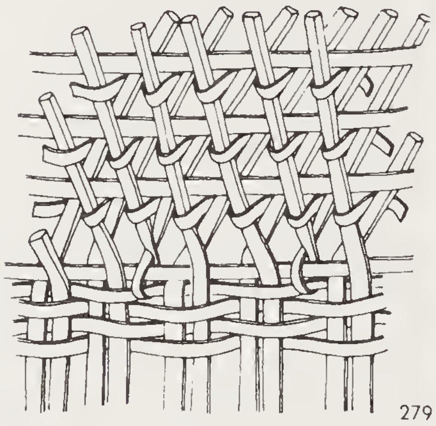

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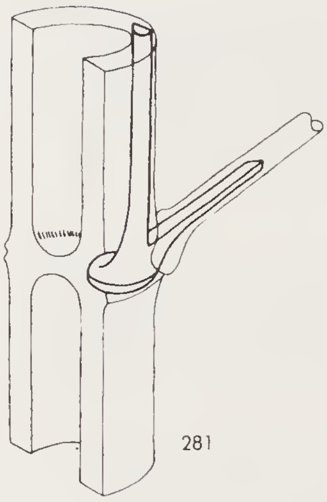

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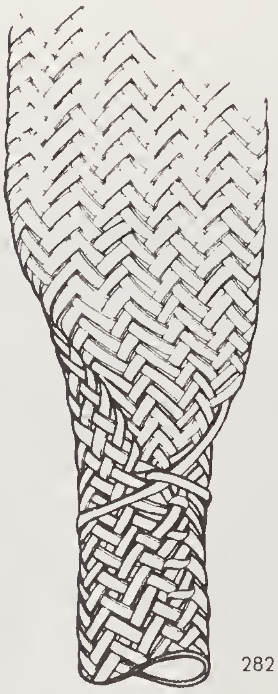

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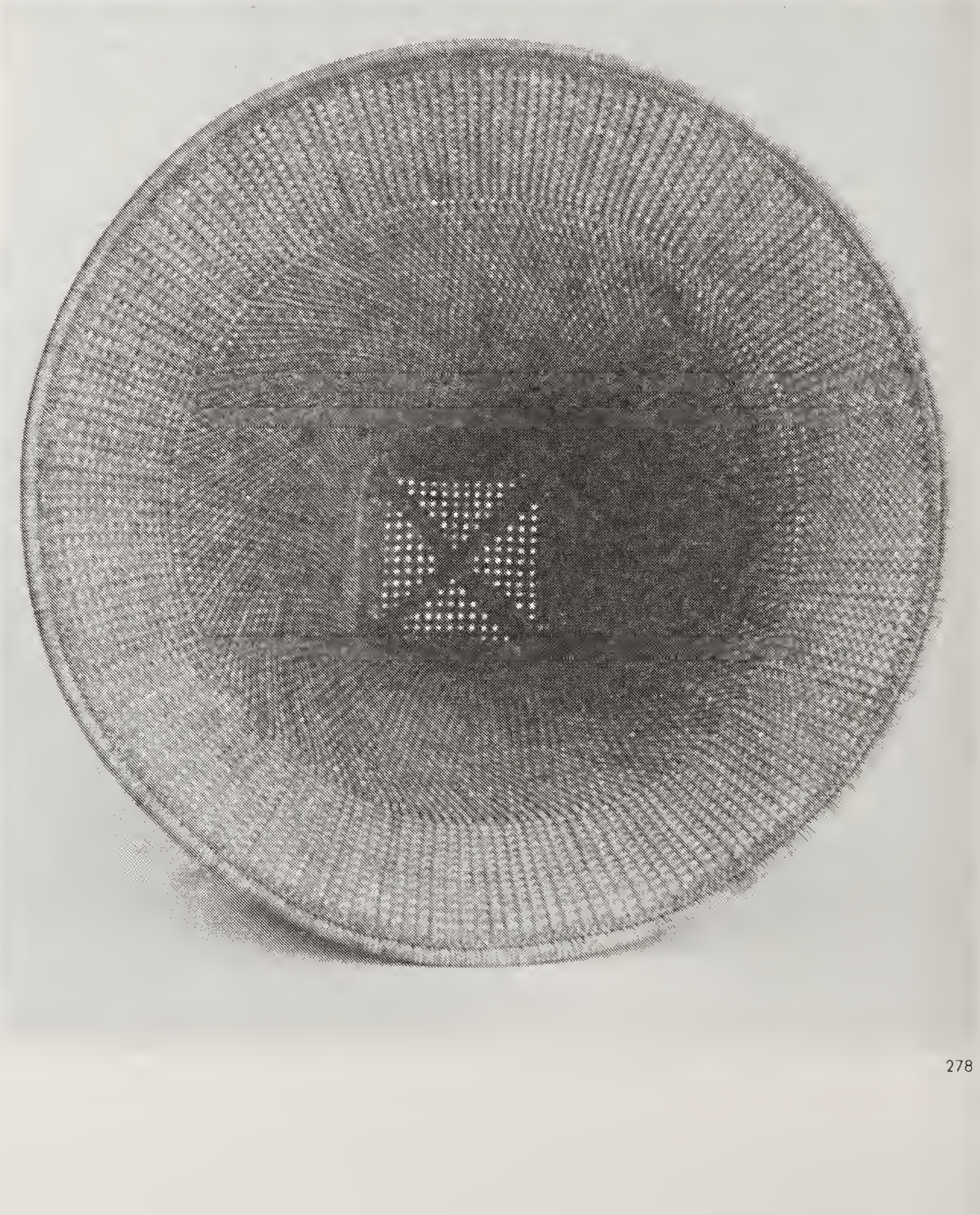

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Rim

Near the rim, all inclined elements are bent to lie parallel to each other in the vertical orientation and the pair of horizontal spirals continue to weave through these elements in a closed weave. A thin braided ridge accentuates the point where the texture changes. The ridge goes three-quarters around the basket leaving the side that comes in contact with the body free of obstruction. At the top of the rim, the warp ends are folded and interlocked with each other (fig. 280). A cane ring is fixed around the folded rim to finish the basket. A split of cane wrapped around the ring is also interlocked with the folded warp ends, thus holding the ring in place.

Legs and Side-Strengthening

A single member, comprising a portion of a bamboo culm ending in a node with a branch protruding from it, is ingeniously used to strengthen the body, provide a stand for the basket, and make the base more firm (fig. 281). The tapered culm portion is inserted into the weave at the rim and tied down along the side of the basket. The carved node at the corner of the base provides one of the feet on which the basket stands, and the branch which is suitably shaped strengthens the diagonal of the base. There are four such elements, one at each corner, and the branches overlap along the base diagonals, where they are tied with a cane split.

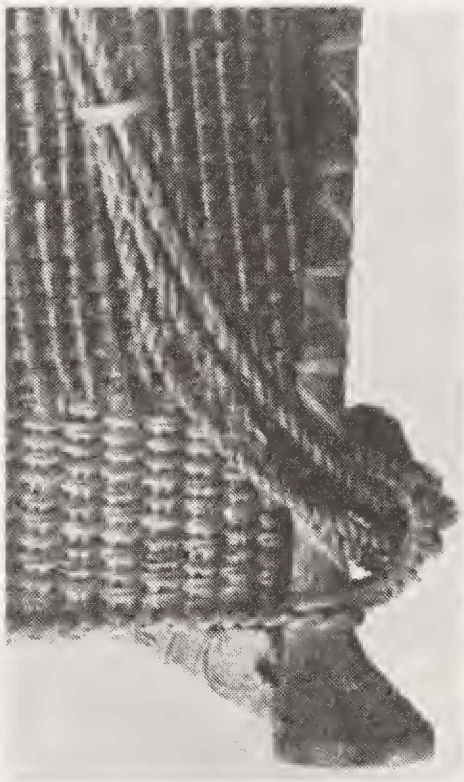
Other Construction Details

A thin cane braid, similar to the one near the rim, strengthens the periphery of the base on three sides, simultaneously anchoring the legs to the basket. The side that is in contact with the body is left clear. A knotted cane hoop is tied on each strengthening element. The head-strap (fig. 282) is held in position by these four cane hoops, such that the braided portion is towards the rim and the adjustable knot of the strap is towards the base of the basket (fig. 283).

Quality Control Methods

The most interesting aspects of this basket are the aids used to control quality. A punched metal plate fixed between two posts is used as a die to control the cross-section of the strips of cane (fig. 284). Each strip is drawn through the appropriate size of the hole to maintain a uniform cross-section for all similar elements. The surface is finished by drawing the strips through a handful of ash and cane shavings. All the materials needed for the basket are cut to predetermined lengths, shaped through the die, finished, seasoned, and stored to be used when required. This procedure has a similarity to mass production methods employed in industry. The warp elements are further shaped so that they are flat at the base and become almost circular in cross-section as they are woven into the body. This shows that there is a degree of precision in working as the length of the flat section is predetermined. The additional strips are also shaped so that they are flat at the centre where they are hooked onto the horizontal elements. The strengthening elements are carefully cut and carved to the required shape before they are stored (fig. 285). The form of the basket is controlled by a mould made from bamboo slats that are slightly curved and tied in shape (figs. 286, 287). Only a few of the best craftsmen make a precise mould, which is then used by less skilled people to make high-quality products.

The high degree of quality consciousness of this product is probably due to its social significance. The constant interaction between craftsmen and their clientele is reflected in the refinement of the product, which increases with the client's expectations. The highly-refined product is sold at a higher cost, which consequently represents the social status of the buyer. It seems that this sort of social pressure helps maintain the quality of the product.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278: The *kophi* as seen from above.

279: The side weave as it begins at the base.

280: Detail of the rim binding.

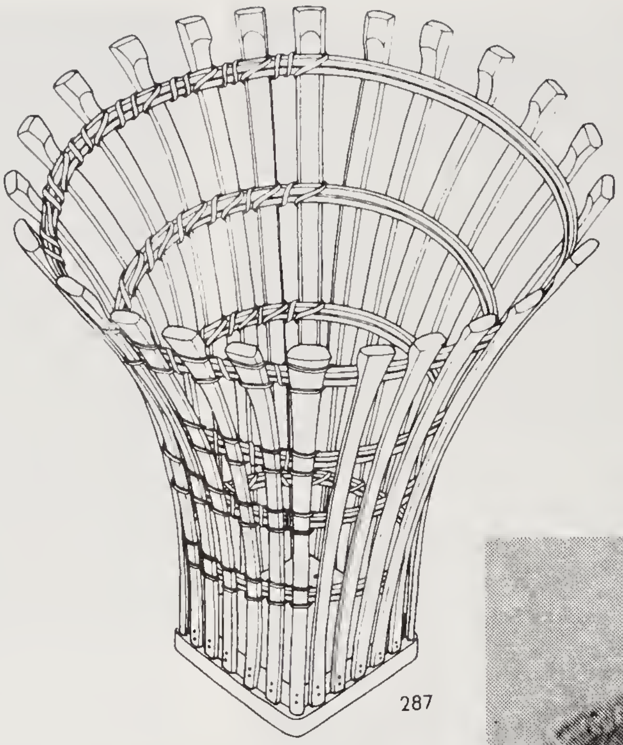
281: The leg element as it is carved from the bamboo culm.

282: The centre of the head-strap is a flat braided band. This is made tubular at both ends to accommodate the supporting rope.

283: The lower portion of the *kophi* with the cane hoop that holds the head strap in position.

284: A punched metal plate is used to control the cross-section of the cane strips.

285: A bundle of strengthening elements ready for use as required.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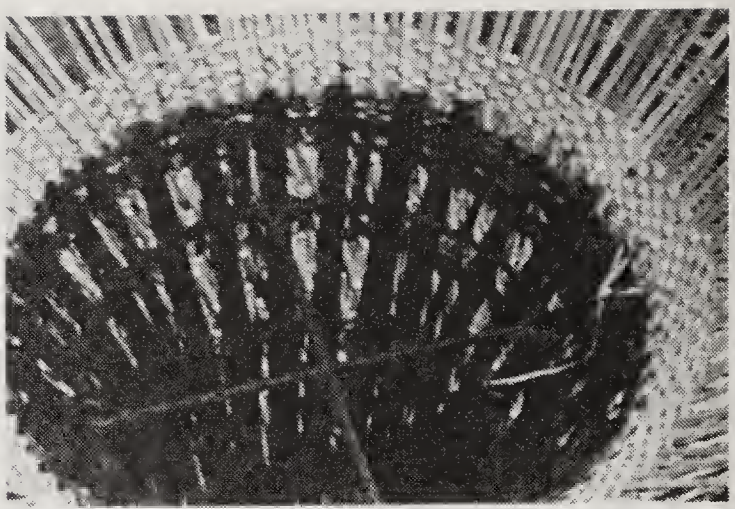
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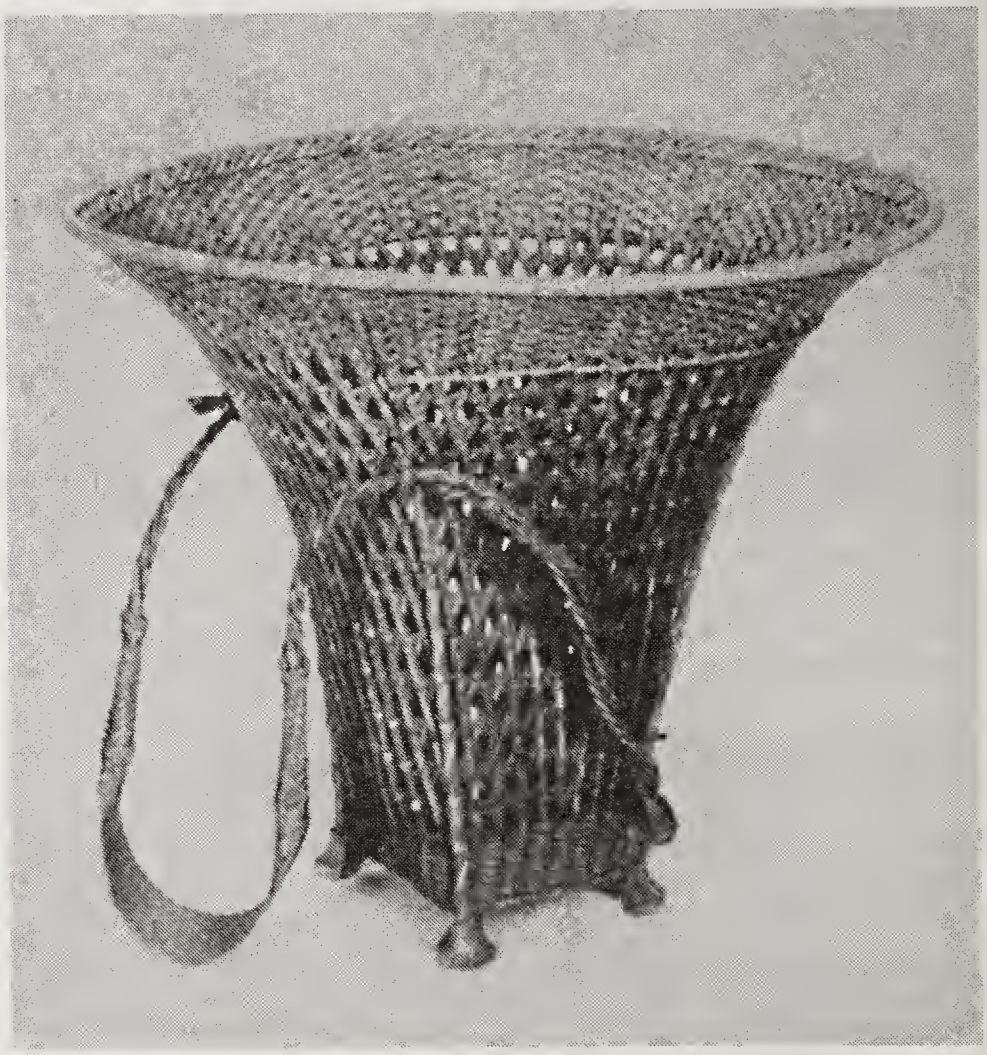
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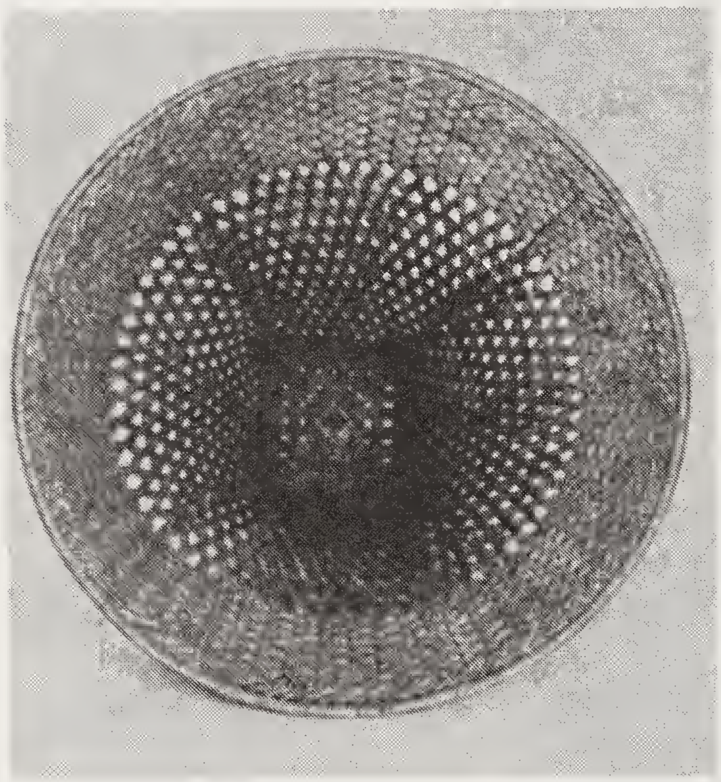
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286: A semi-finished *kophi* on the mould.

287: The mould made from bamboo slats fixed to a wooden base.

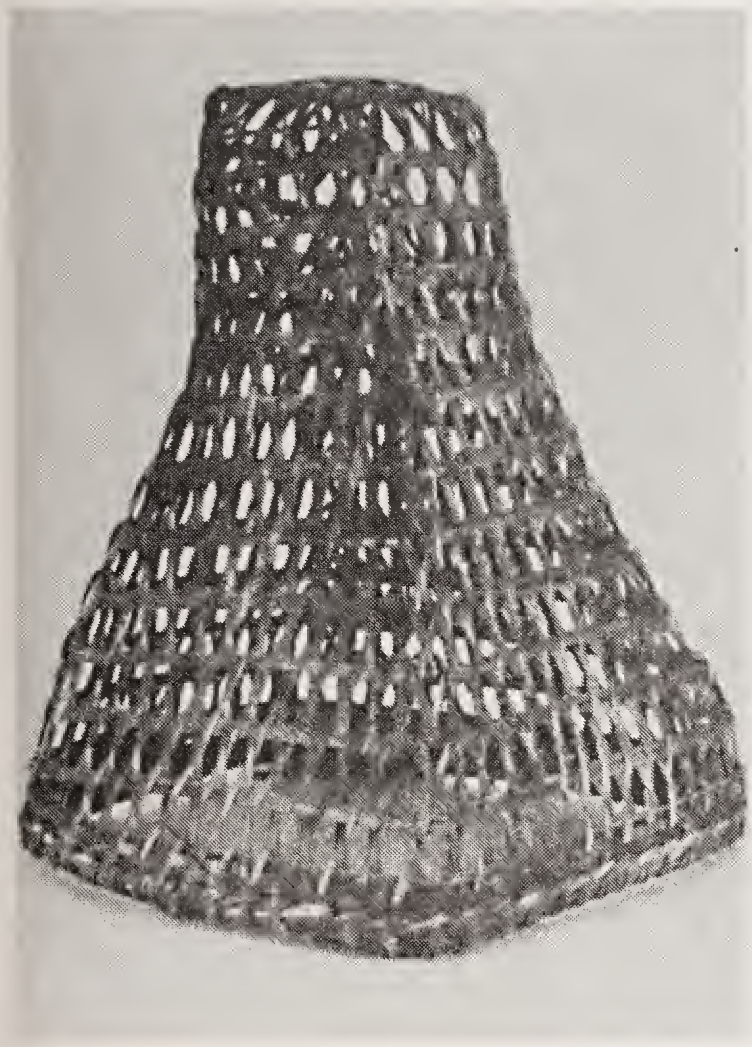
288: A coarse version of the *kophi* for rough use.

289: The basket as seen from above.

Coarse *Kophi*

There are two other similar baskets made by the Angamis. One of these is used by women for marketing. The construction and form is similar to the *kophi,* the main difference being in the detailing. The strips of cane used are twice as thick; the tying details, the hoops and the binding around the base are not as decorative as in the *kophi.* The method of construction, however, is identical and the same mould is used, so that the form is identical. It is only the refinement that is lacking (figs. 288, 289).

The third basket is slightly bigger than the other two. The form and construction remain the same. All the vertical elements are made from bamboo strips that are thicker than in the other two baskets. The distance between the elements is greater, creating distorted hexagonal holes. This basket is for rough use, to carry firewood or grass. Here again, it is only the details that lack refinement. The elements used to make up the basket are sized through a die, and a mould is used to control the form.



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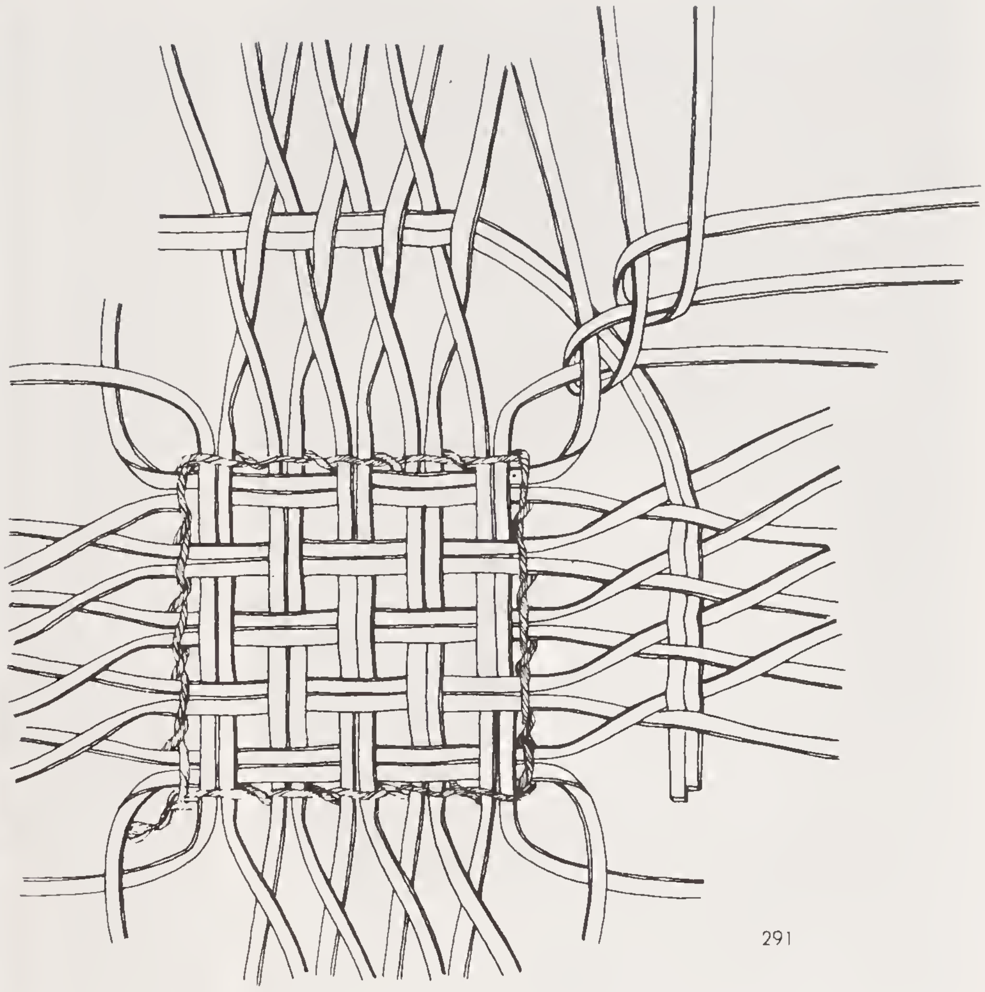


291

290: The *poshong*, a Monpa basket.

291: A flattened view of the base and part of the side showing the additional elements.

Poshong

The *poshong* is an open-weave carrying basket made by the Monpa tribe of Western Arunachal Pradesh. It is used to carry firewood, field produce and for marketing (fig. 290). This basket is made from a bamboo locally called *mayee*, which has a small diameter about 25 to 30 mm. Only the outer split is used.

Shape and Size

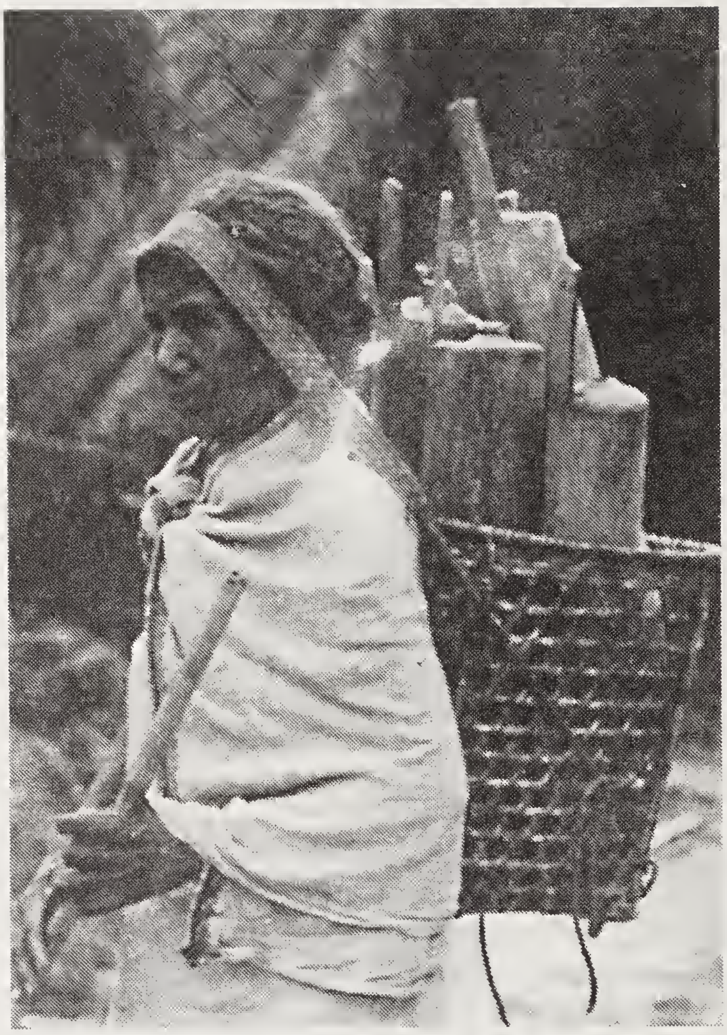
The form of this basket is unusual as it starts from a small square base and the sides are almost vertical upto a third of its height before it flares out to form a large square rim. Hence the cross-section of this basket at any point would be a square though the size may vary. The diagonal of the base measures 160 mm, the diagonal of the square at the rim is 450 mm and the height is 500 mm.

Base and Side Weave

The square base is made of only a few of the elements used inclined in the open-hexagonal weave of the sides. Additional elements are added to make up the required number in the sides. Four additional elements are added to each row of hexagons, always appearing at the corners of the square (fig. 291). Hence, along the four vertical edges of this basket these additional members appear as a series of loops locked into the weave and providing two inclined elements to the side, each in a different direction. The horizontal element of the hexagonal weave is a continuous spiral starting from the base and leading up to the rim.

Rim and Other Details

The perimeter of the square base is stabilised by a rope made of two strands of twisted bamboo splits, such that the pairs of elements extending outside the base are locked within the twists in the rope. The rim of this basket is self-strengthened, i.e., the length of inclined elements extending



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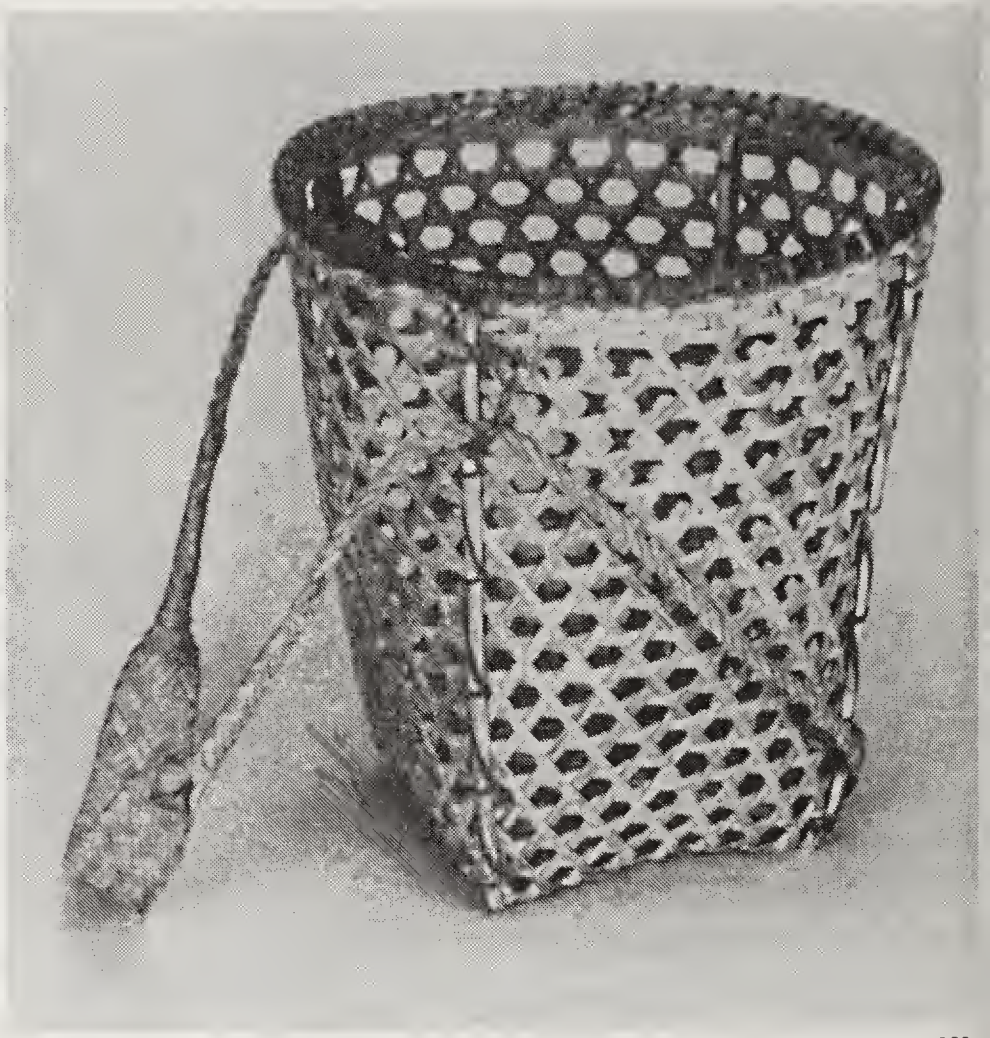

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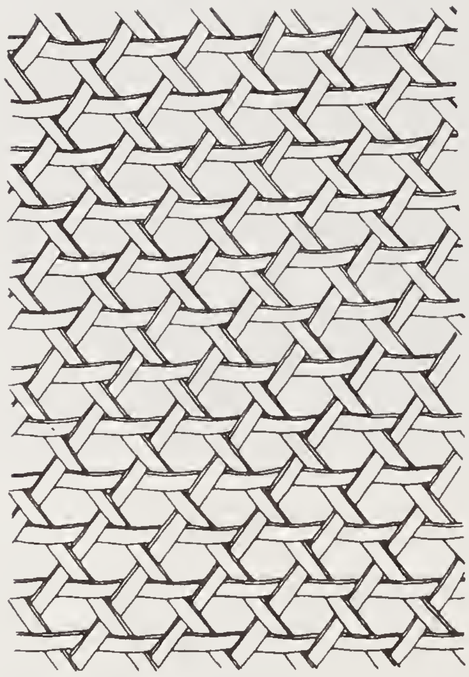
above the intended rim are bent into a series of loops before the remaining length is tucked into the adjacent loops. In this way the rim becomes a thick band made up of layers of overlapping elements. This rim construction is very typical of the Monpas of Arunachal Pradesh.



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292: The *dikhangra*, a Dimasa Cachari basket.

293: A Dimasa Cachari woman carrying water tubes in the *dikhangra*.

294: The side weave forms almost regular hexagons.

Dikhangra

The *dikhangra* is an open-weave carrying basket used by the Dimasa Cachari tribe (figs. 292, 293). The basket is made entirely of splits of cane locally known as *raiwai.*

Shape and Size

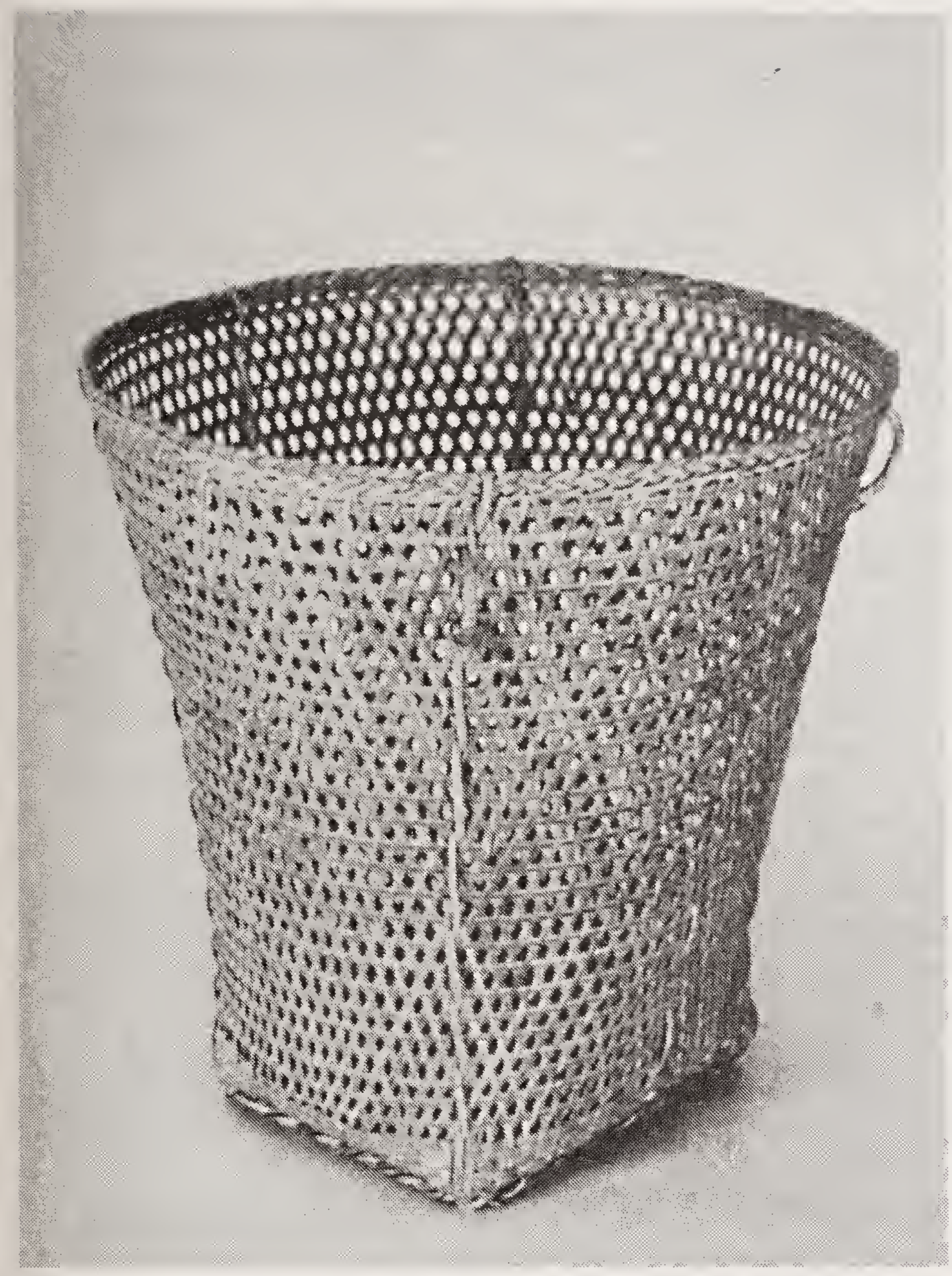
The basket is relatively short in height, with a large square base and a circular rim. The diagonal of the base measures 300 mm, the rim diameter 380 mm and the height is 400 mm.

Base and Side Weave

The square base is woven in a simple basket weave and the sides in an open-hexagonal weave. The base elements extend to form the inclined elements on the sides of the basket. The inclination is almost 30° off the vertical, hence the hexagons formed by the spiralling horizontal elements are almost regular hexagons (fig. 294). The sections of both the horizontal and the inclined elements are approximately the same, i.e., 8 mm wide and 2 mm thick. This ensures that the stress deflection is apparent in all elements, the horizontals slightly more.

Rim and Other Details

The base and sides of the basket are strengthened. This is achieved by a single length of half-cane split being applied to the base square along the diagonal before moving up the sides at the corners. The same split turns around the weave at the rim to return along the inner face of the basket and over the base on the inside. Hence the side and base weaves are sandwiched between these splits before they are lashed together by fine cane splits. Two



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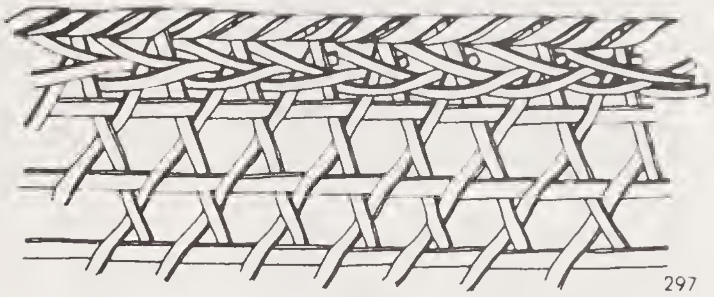

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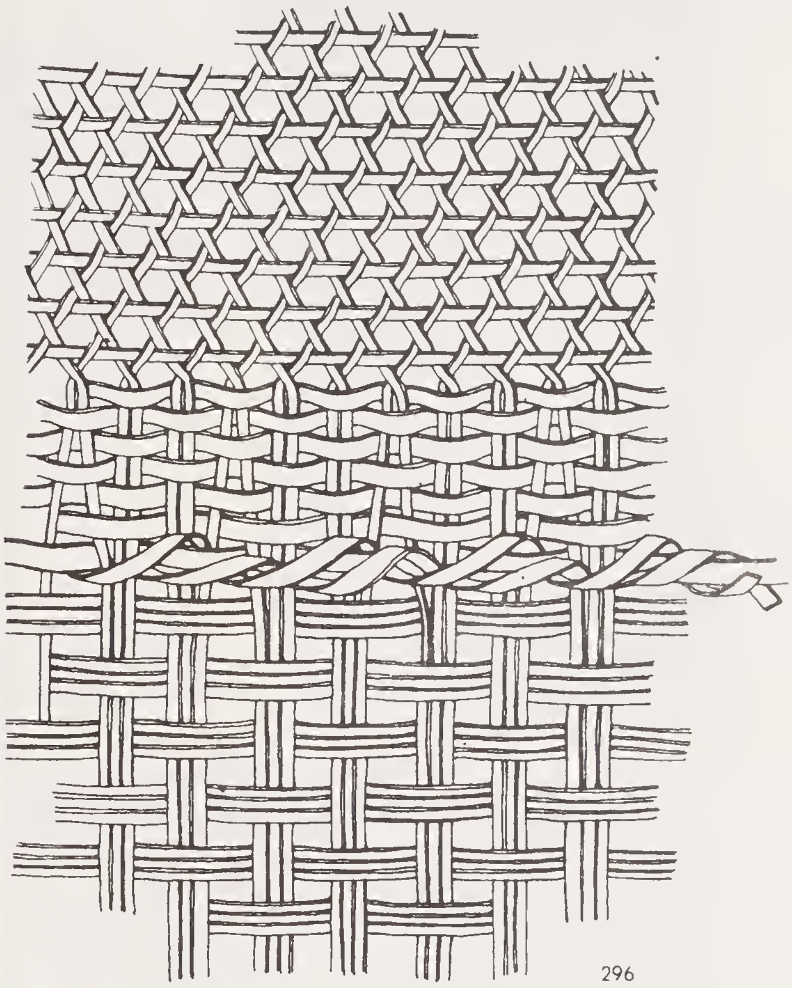

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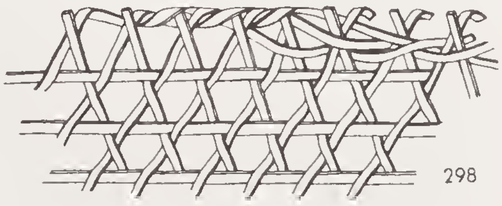
such sets are used along both diagonals of the base square. The rim is strengthened by binding a ring of half-cane split on the outside surface of the hexagonal weave after the loose ends have been folded back. Loops of twisted rope made from cane splits are attached to the vertical strengthening elements to provide supports for the carrying straps.



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295: A Khiamngan Naga firewood basket.

296: A flattened view showing the transformation of the base to the side weave.

297: The self-strengthened rim as seen from the outside.

298: The movement of individual warp elements as they form the self-strengthened rim.

Khiamngan Naga Firewood Basket

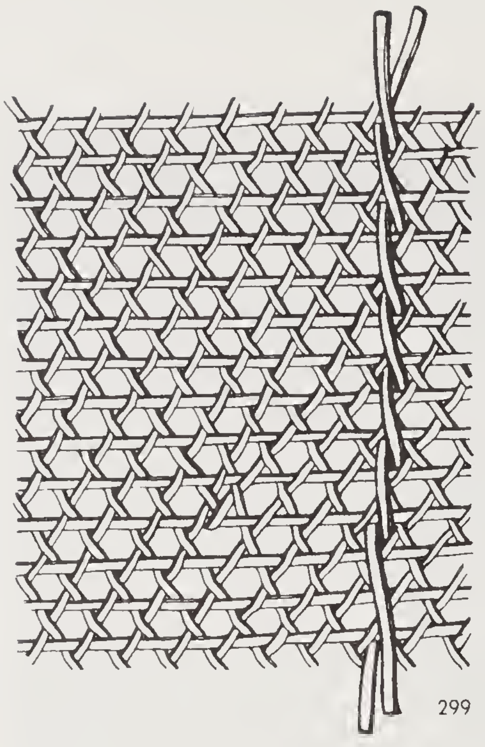
This basket is used by men to carry firewood. It is made by the Khiamngan Naga tribe living in villages east of Tuensang (fig. 295). Carried with a headstrap, it is made entirely of fairly thin cane splits.

Size and Structure

The basket has a rectangular base of sides 220 mm by 160 mm, a circular rim of diameter 360 mm and a height of 360 mm. The base is woven in a simple basket weave and unlike other baskets of this type, three sets of elements make up the base weave instead of these being in pairs. Individual elements are 3 mm wide and 1 to 1.5 mm thick. The side weave is an open-hexagonal weave with the horizontal element moving in a spiral (fig. 296).

Rim and Other Details

The rim is self-strengthened in a simple and interesting manner, resulting in a strong, flat, but flexible edge with no addition to the thickness of the hexagonal weave (figs. 297, 298). The strengthening of the sides, done vertically from the corners of the base to the rim, is achieved by a cane split,



about 4 mm wide and 2.5 mm thick, which is folded over the rim before the two ends twist around each other and simultaneously weave in and out of the side weave all the way down to the corner of the base (fig. 299). The perimeter of the base rectangle is also strengthened in a similar manner. Hoops for the head-strap are attached to the side-strengthening elements.

Thsa

The *thsa* is a firewood basket used exclusively by women of the Khiamngan Naga tribe (fig. 300). The significant difference from the men's carrying basket is that this has a split down one side of the basket.

Size and Structure

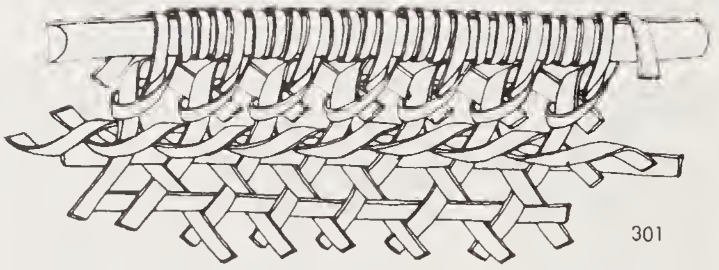
The basket has a rectangular base 340 mm by 200 mm, the rim is the same size as the base, the sides being almost vertical, and the height is 400 mm. The sides of the basket are strengthened by four vertical members of thick bamboo bound to the hexagonal weave with split cane. The rim is strengthened by a length of split cane which is thick and rounded (fig. 301). The open edge of the hexagonal weave is finished by interlocking the loose ends. The rim-strengthening element is bound to this finished end by a split-cane binding wrapped around the thick element. The edges of the slit side of the basket are also cleverly finished (fig. 302). At these edges the inclined elements of the hexagonal weave, on reaching the slit, are taken around a length of bamboo split located on the inside surface at that edge, before they return across the face of the hexagonal weave inclined in the opposite direction. The thick rim-strengthening element continues over the

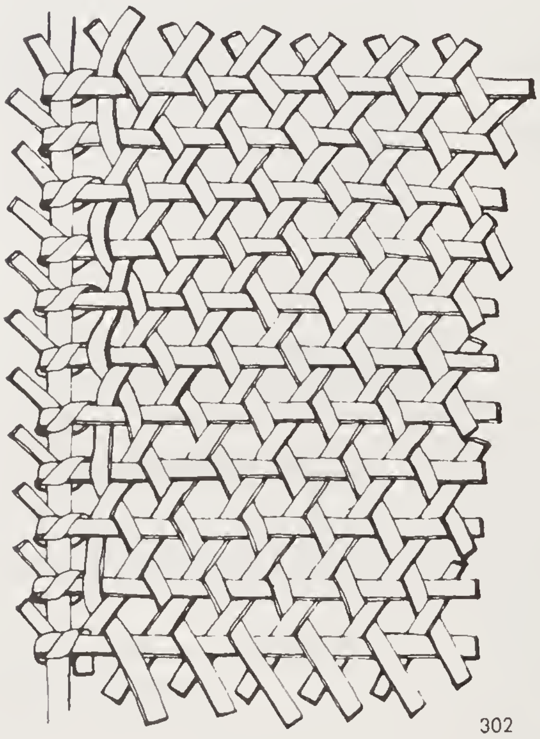
299: The sides are strengthened by cane splits.

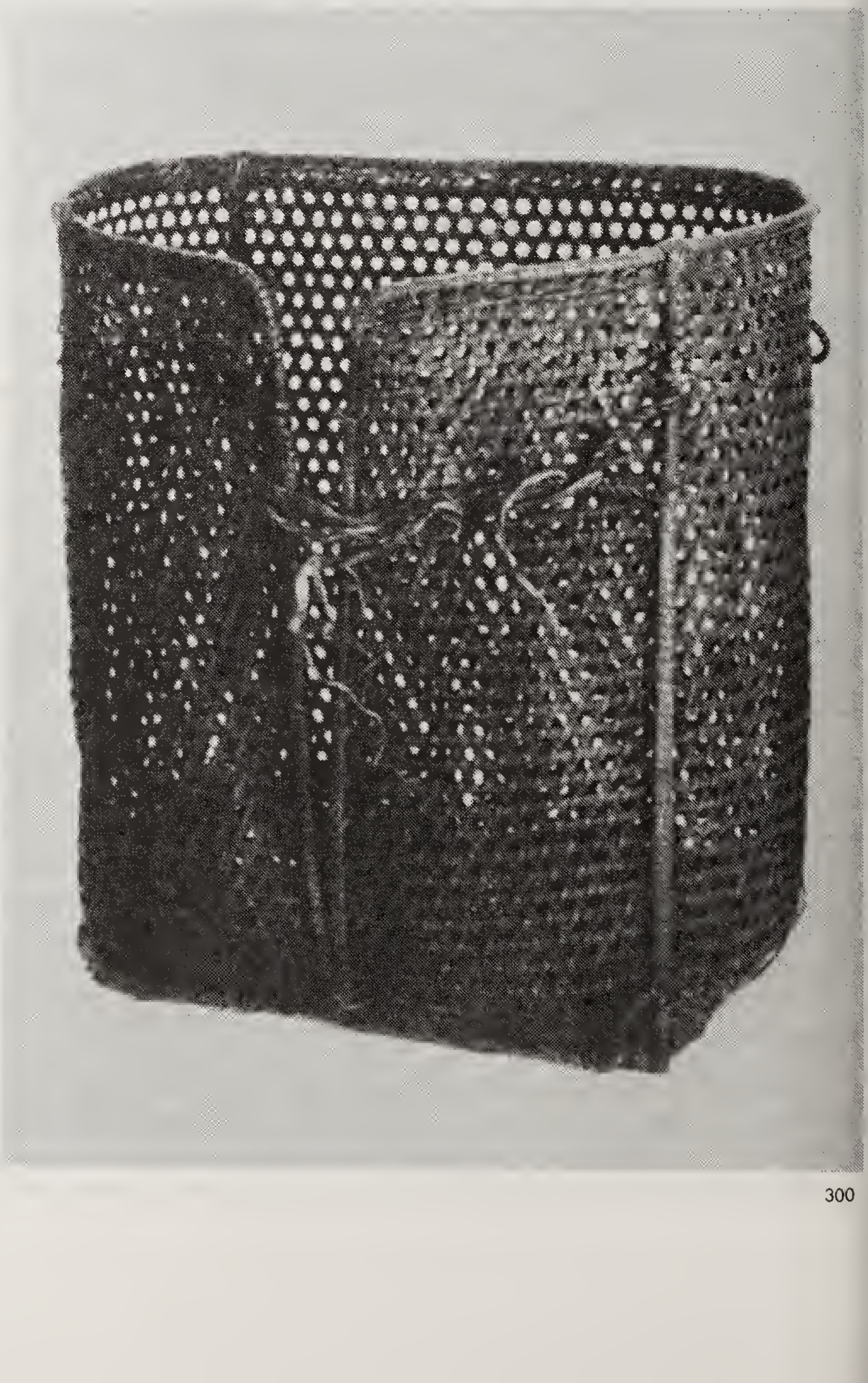
300: The *thsa*, a Khiamngan Naga firewood basket used by the women.

301: Detail of the rim binding.

302: The termination of the hexagonal weave at the side slit.







outer face of the slit edges. The slit in the side of the basket makes it adjustable to the varying sizes of load to be carried.

Chong

The *chong* is an open-weave carrying basket used by the Nocte tribe of Arunachal (fig. 303). It is made from split cane.

Size and Structure

It has a small rectangular base 120 mm by 60 mm, a circular rim 320 mm in diameter and it is 480 mm high. The side of the basket is made in an open-hexagonal weave with the horizontal moving in a continuous spiral from base to rim. Since only a few of the inclined elements start from the base, additional elements are required as the side weave progresses towards the rim. The rim is strengthened by a thick cane split which is bound to the folded edge of the hexagonal weave (fig. 304). The sides are strengthened by cane splits going down one side, under the base and up the other side. These elements are bound to the side weave by a length of split-cane binding which is knotted through the side weave at intervals.

Kendra

The *kendra* too is used by the Noctes. It is similar in form and construction to the *chong*, though much smaller in size (figs. 305, 306). The base square diagonal measures 60 mm, the rim diameter is 180 mm and the height 260 mm. This size is used by young girls to carry their belongings to the fields, perhaps in preparation for heavier tasks in the future.

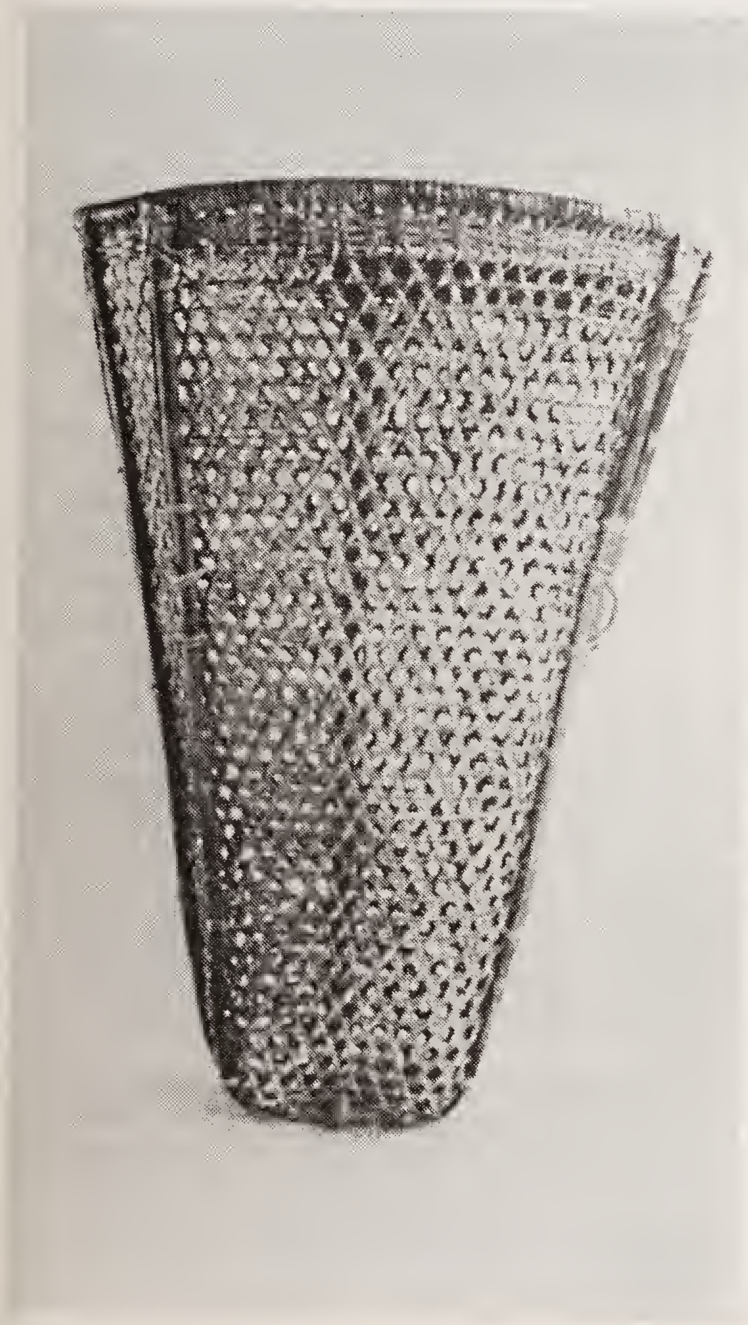
303: The *chong*, a Nocte basket.

304: Detail of the rim binding and side strengthening element. The latter is partially cut away to show the binding detail.

305: The *kendra*, a Nocte basket.

306: A Nocte girl carrying the *kendra*.

306



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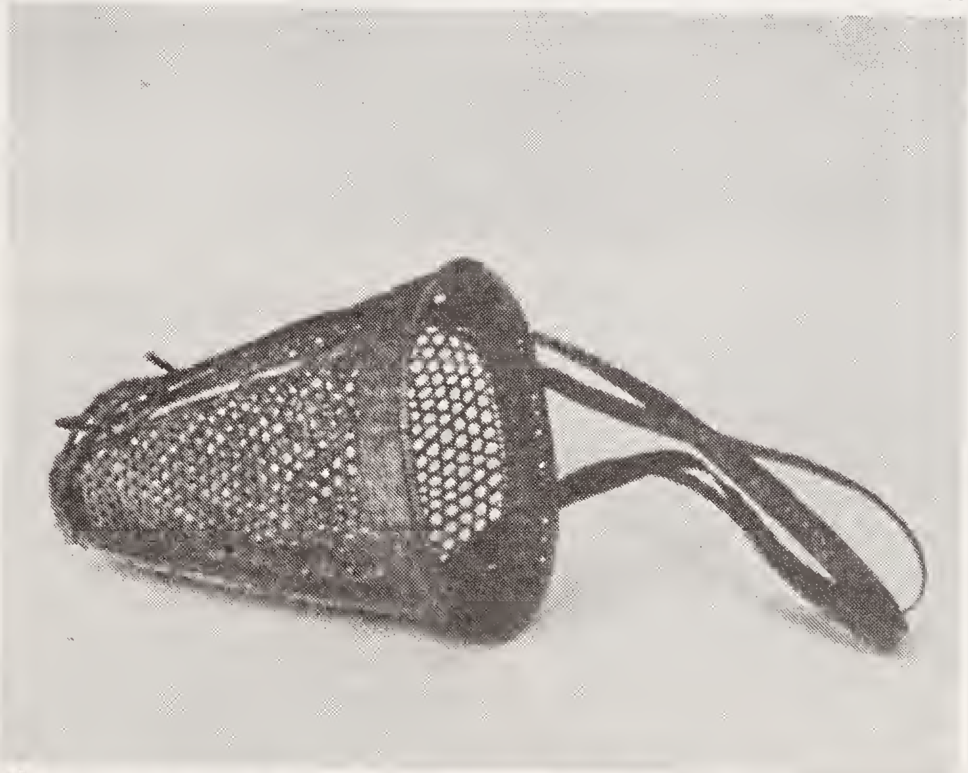

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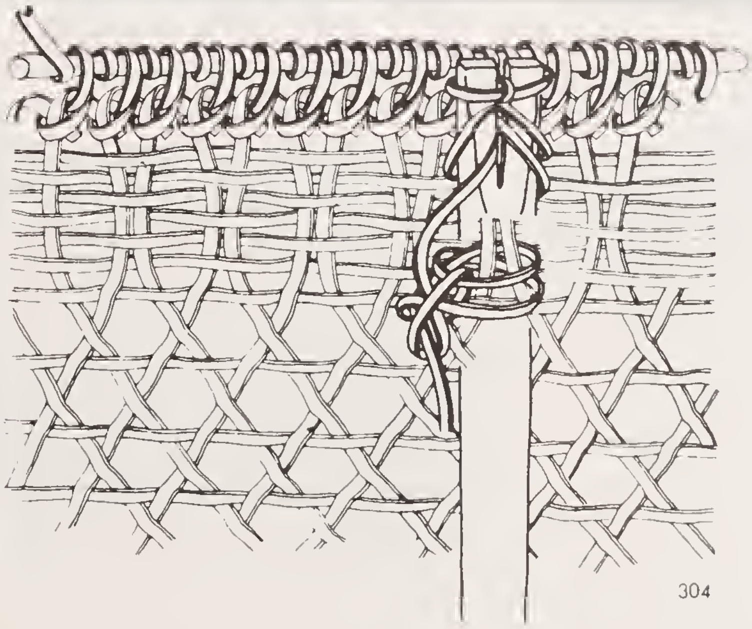

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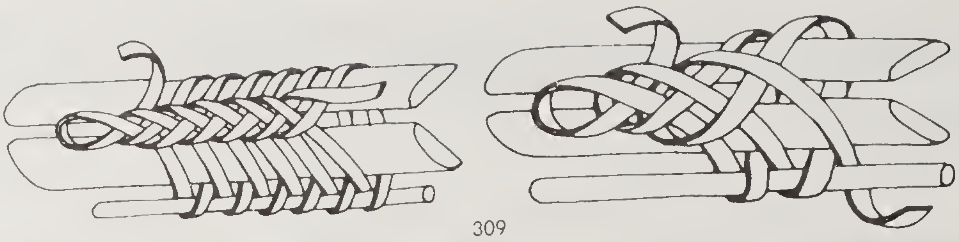

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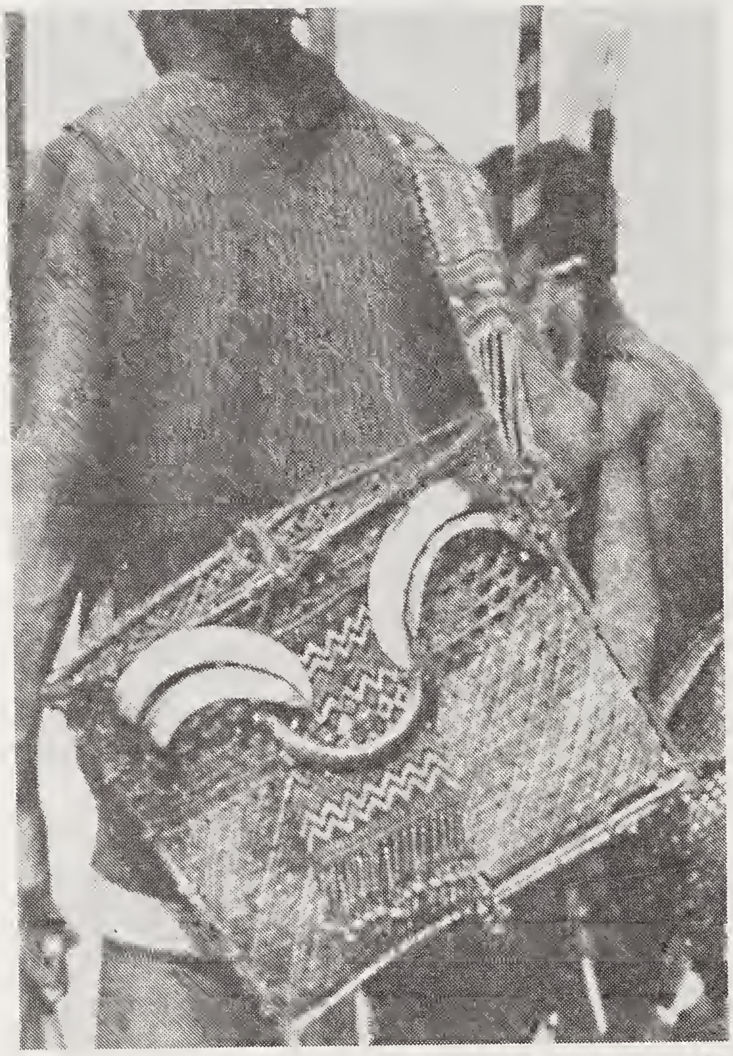

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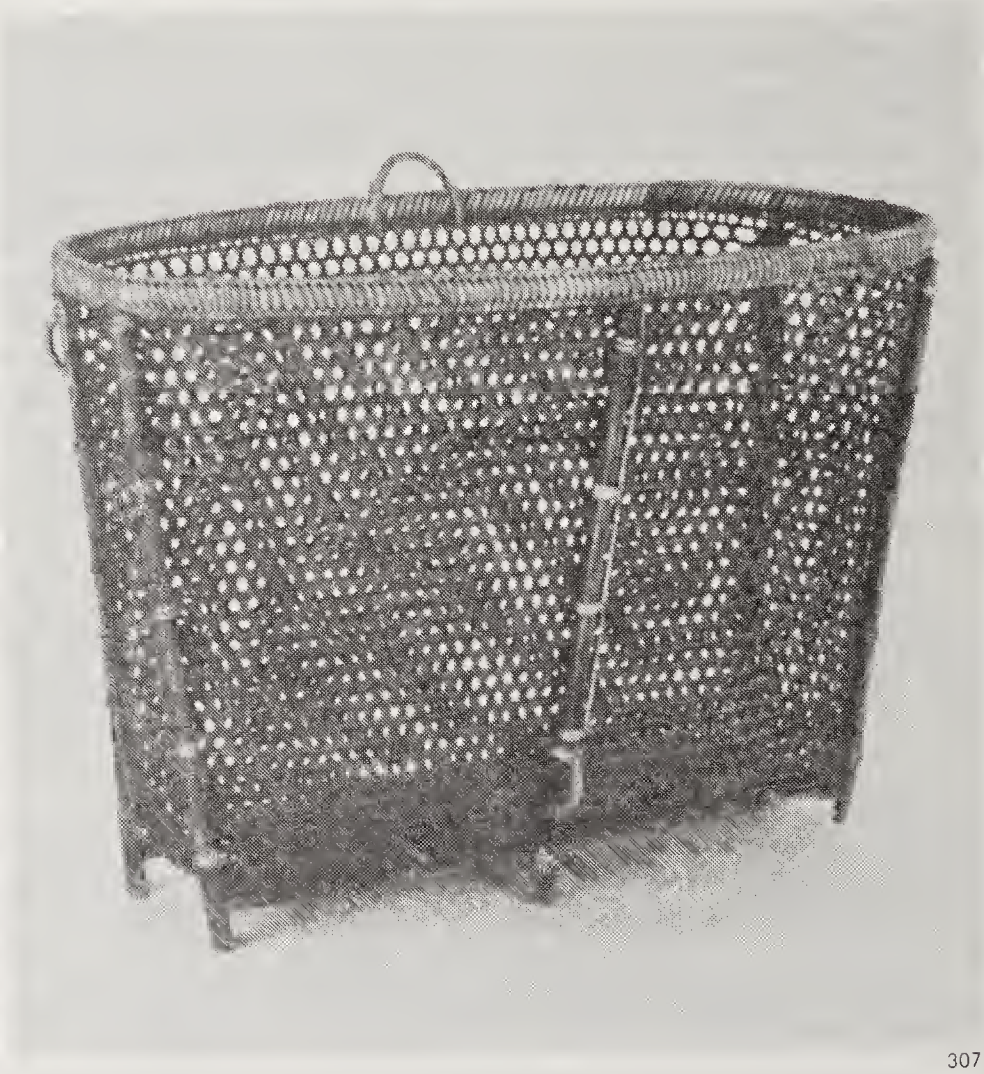


307

307: A Konyak Naga basket.

308: A Konyak Naga carrying a basket decorated with the tusks of a wild boar.

309: Detail of the rim binding. The movement of the cane split used for binding is seen.

Konyak Naga Basket

This basket is used by Konyak Nagas living in Mon District of Nagaland to carry firewood or personal belongings (fig. 307). It is carried over the back, using a shoulder strap (fig. 308). The basket is made of fine strips of bamboo woven in an open-hexagonal weave with cane splits used in binding the rim and strengthening members.

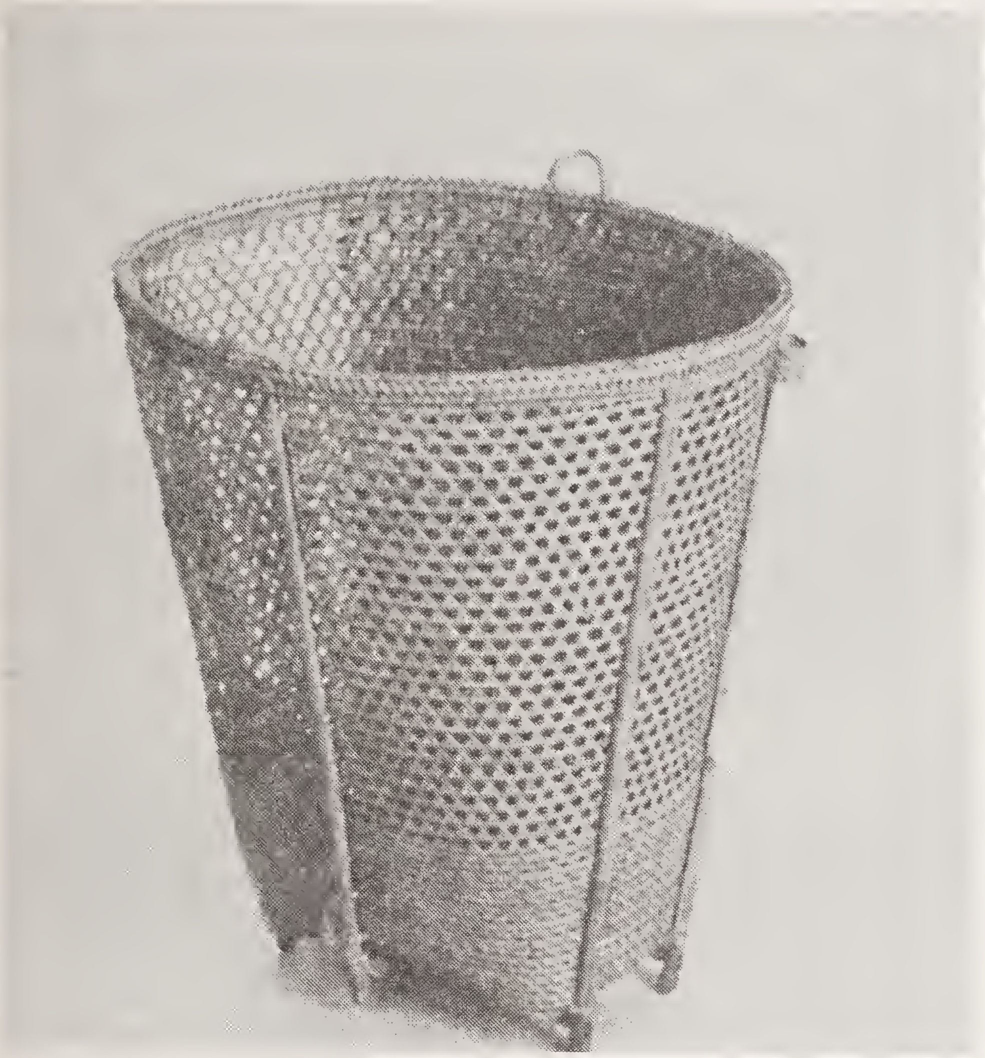
Size and Structure

The basket has an elongated rectangular base 290 mm by 70 mm, an elliptical rim 350 mm by 180 mm and it is 280 mm high. The base is woven in a simple basket weave with the elements taken in pairs. The side has the open-hexagonal weave with the horizontal moving in a spiral. The hexagons generated are almost regular.

Rim and Other Details

The interesting construction details are the rim binding and the side strengthening. The edge of the hexagonal weave side is held sandwiched between wide splits of bamboo and bound with cane splits (fig. 309).

The side-strengthening element uses strong bamboo splits bound to the hexagonal weave by continuous lengths of split cane knotted intermittently. All the side-strengthening elements have a short length of branch which has been left attached. These branches are used to strengthen the base of the basket and short lengths of the split extending below the branch act as legs. Five such elements are used, four of these located at the corners of the rectangular base and the fifth along the side away from the body.



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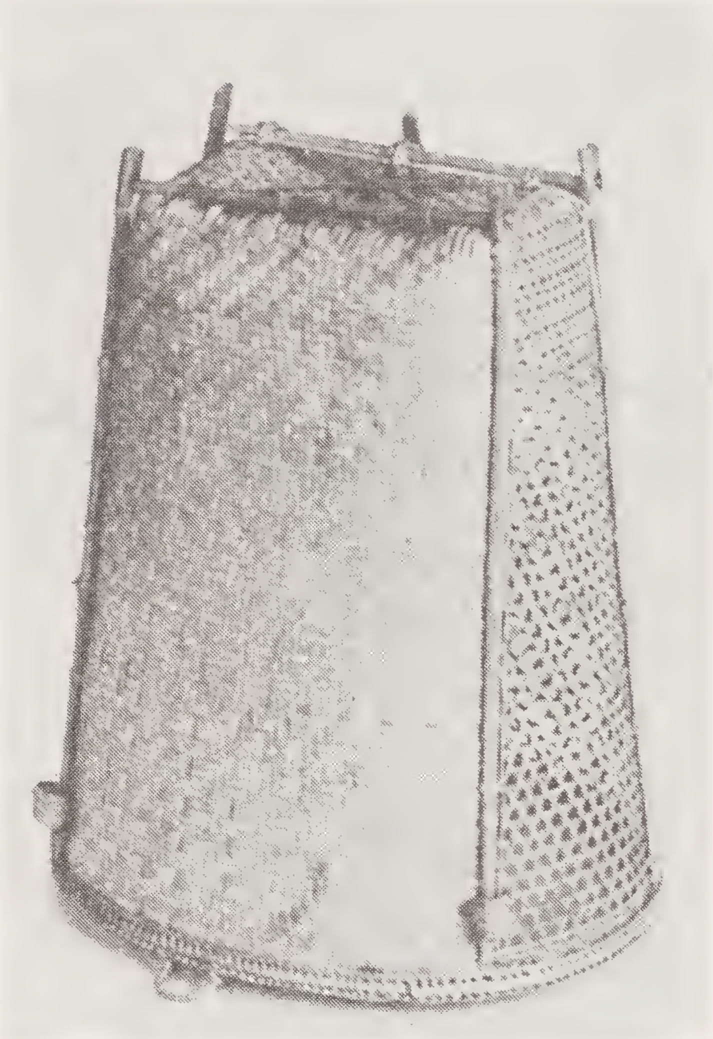

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Throng

The *throng* is an open-weave basket used by the Konyak Nagas to carry firewood, water tubes and for general marketing (fig. 310). This basket is similar in material and construction to the Konyak basket described earlier. The shape is different and there are three significant differences in detailing.

Size and Weave Structure

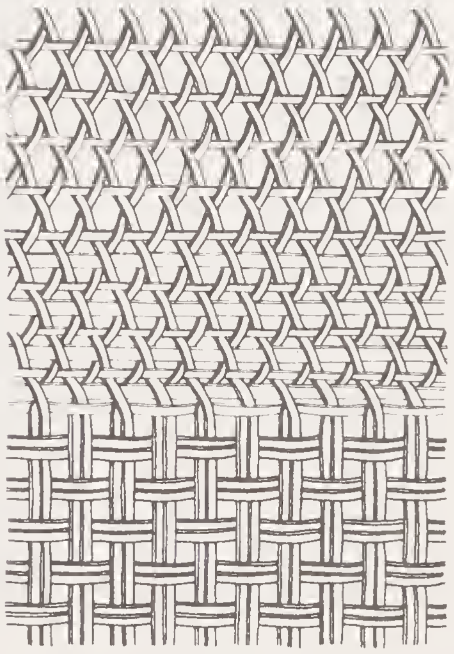
This basket has a rectangular base 190 mm by 100 mm, an elliptical rim 300 mm by 260 mm and it is 360 mm high. In this basket the open-hexagonal weave is filled in to about a third of its height by a wide horizontal element moving in a spiral and lying between the two inclined layers such that it moves across the face of consecutive hexagons (fig. 311). This effectively reduces the open areas in the weave where the additional horizontal element is used.

Leg Detail

The other detail is the joint between the side and base-strengthening elements, both being made from stout splits of bamboo. Here the base-strengthening elements act as struts, each between a pair of side-strengthening elements. Each base strut is tapered at both ends and these tapered ends are housed in holes of a suitable diameter burned into the side elements by a red-hot iron poker. Each set of base and side elements are bound to the base and side weave respectively by a length of split-cane binding knotted intermittently.

Superimposed Mat Wall

The third interesting detail is the double-walled construction at the back of the basket. A closed-weave mat made from split bamboo and woven in a twill pattern is superimposed on the open-hexagonal weave. This mat is held firmly against the side, by bindings at the rim as well as those used to hold the side and base-strengthening elements (fig. 312).



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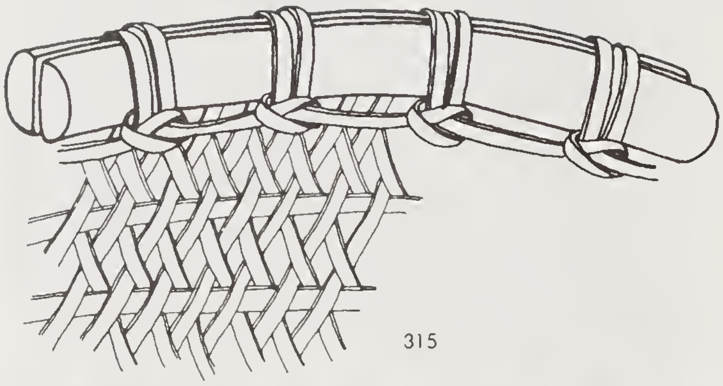
310: The *throng*, a Konyak Naga basket.

311: A flattened view of the base and part of the side weave.

312: The *throng*, standing on its rim. The closed-weave mat can be seen superimposed on the back of the basket.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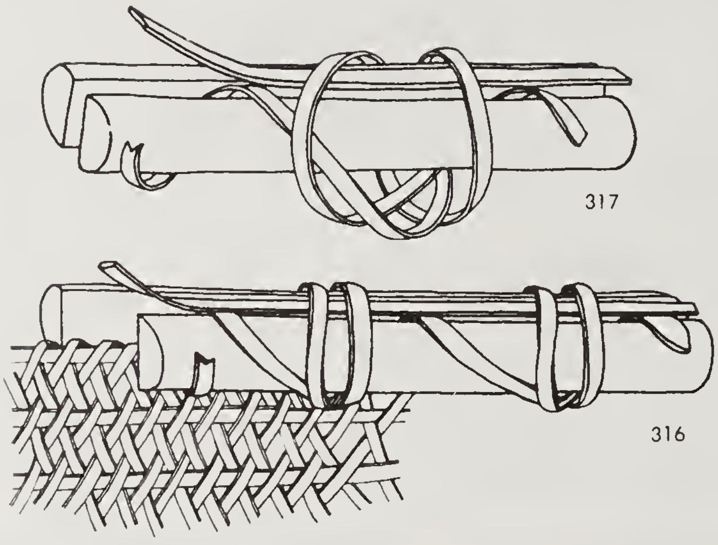
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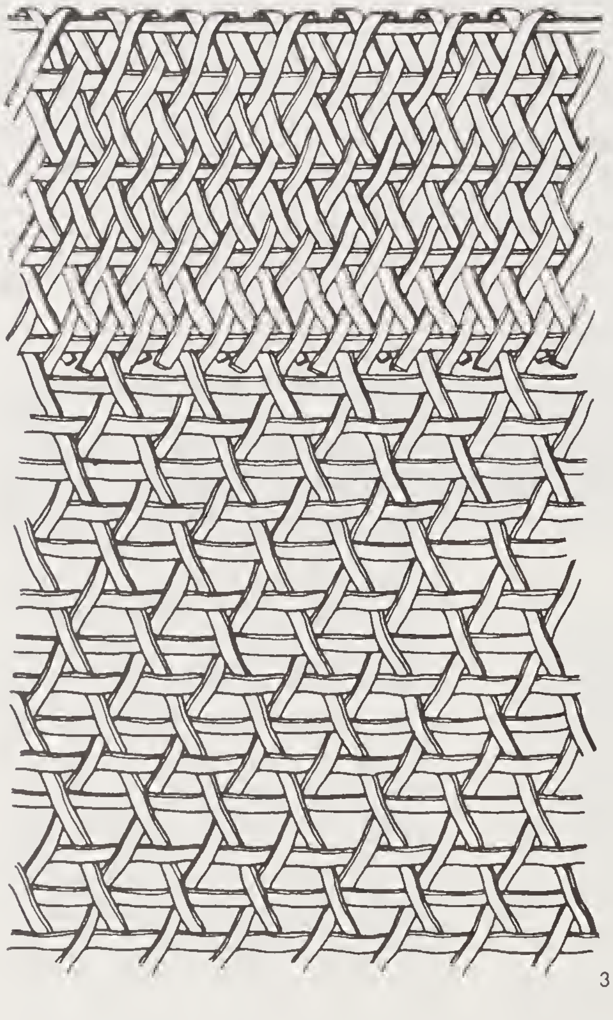
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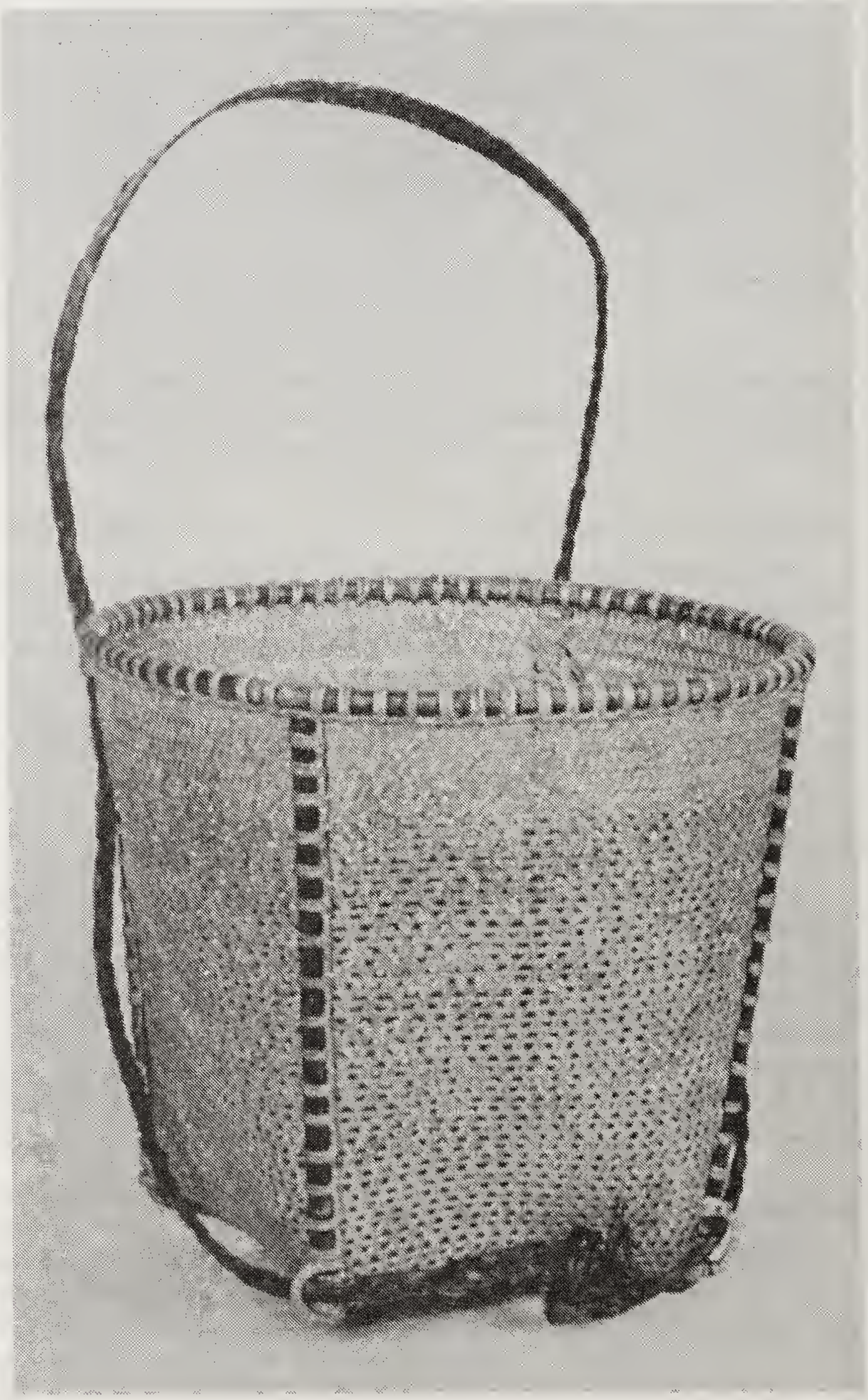
313: The *barju*, an Apa Tani basket.

314: The side weave near the rim.

315: Detail of the rim binding.

316: An alternate way of binding the rim.

317: The movement of the cane split in this binding.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Barju

The *barju* is an open-weave basket used by the Apa Tani tribe living in Subansari District of Arunachal Pradesh (fig. 313). It is carried by women who use it for marketing and other general purposes. The basket is woven from fine bamboo splits and is strengthened at the rim, sides and base by thick cane splits.

Size and Shape

The basket has a square base and circular rim. The diagonal of the base measures 270 mm, the rim diameter is 330 mm and it is 270 mm in height. The bamboo splits used to weave the base and sides are very fine, i.e., 2 mm wide and a fraction of a millimetre in thickness so that these splits are translucent when held against the light. Baskets intended for rough use are made using coarser splits.

Base and Side Weave

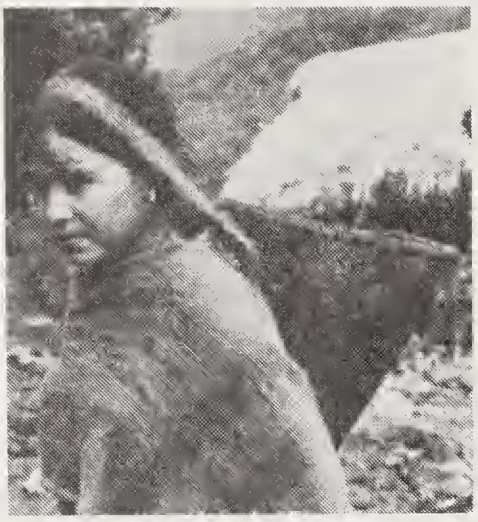
The base is woven in a simple basket weave while the side is a variation of the open-hexagonal weave. In the sides, the inclined elements of the hexagonal weave are locked by the spiralling horizontal element weaving into the open rhombus created by the overlapping inclined elements. An additional element is introduced in the gap between two consecutive turns of the previous spiral so that this new element lies passively between the two layers of inclined elements unlike the previous one that weaves in and out. The second spiralling element bisects the open hexagons into two small trapeziums by passing across the centre of the hexagons and reducing the open areas.

This space-filling element is stopped slightly short of the rim, above which point the side weave is treated differently. Here the inclined elements are woven in the open-hexagonal weave without using the horizontal space-filling element. The weave is continued upto the desired height where the inclined elements are bent over the edge and returned into the weave below to fill in the inclined diagonals of the open hexagons. This creates a different texture from that of the weave below (fig. 314).

Rim and Other Details

The edge of the weave is then strengthened by sandwiching between two rings prepared from longitudinal half-sections of cane. These two rings are bound together by split-cane binding passing through the side weave at the rim (fig. 315). The side and base strengthenings are achieved by two half-splits of cane forming the diagonals of the square base before being bent up to extend over the side weave upto the rim. These elements are only on the outside of the basket and they are bound to the side by a length of split-cane binding knotted intermittently, holding the element to the side weave. Two rings made of braided cane splits are anchored to the side-strengthening elements near the rim. These are used to support the head-strap. Two other hoops are provided for the same purpose on the opposite side of the basket, near the base. Some of these baskets use an alternate rim binding detail (figs. 316, 317).

In the finer versions, great care is taken in finishing individual elements before they are woven into the basket. The individual elements are seasoned by smoking over a fireplace so that they acquire a rich red-brown colour. Selected elements are smoked to a deeper colour and these are used sensitively in the weave structure to enhance the appearance of the product. The smoking can continue even after the basket is made which also preserves the product.



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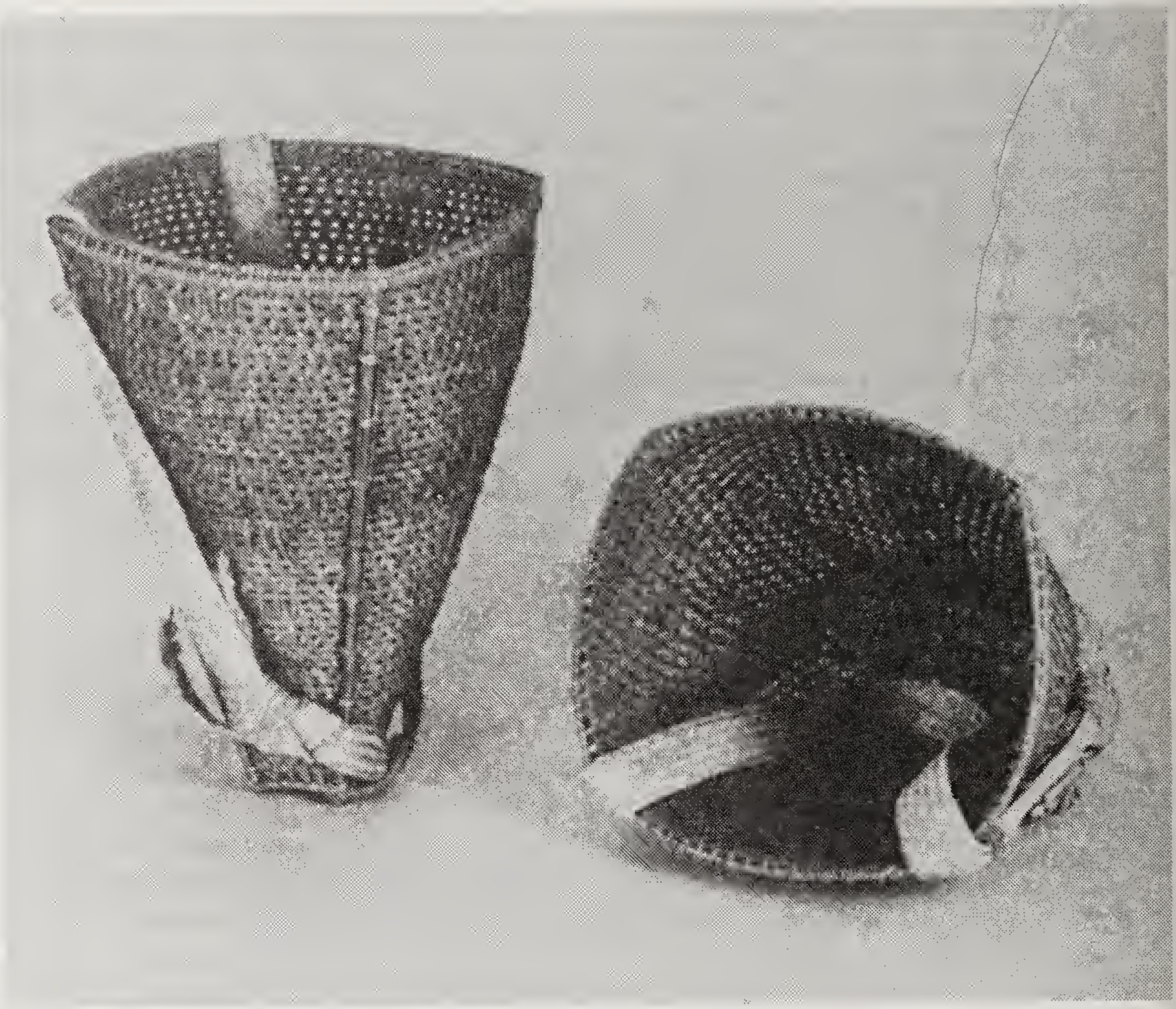

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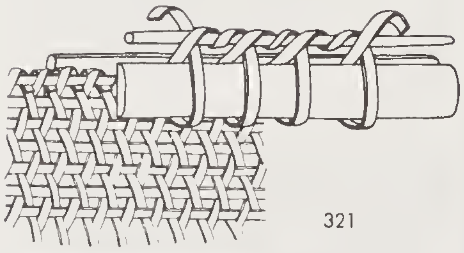

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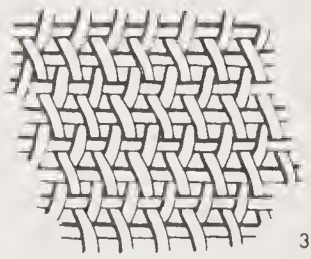


320

318: The *barsi*, an Adi Gallong basket.

319: An adi Gallong woman carrying the *barsi.*

320: The side weave.

321: Detail of the rim binding.

322: The *khoru*, a Naga basket.

323: The *khoru* as seen from above.

324: The square base is strengthened along the edges and diagonals and at the corners.

325: A wide bamboo split is knotted at each corner of the base to form the legs.

Barsi

The *barsi* is an open-weave basket used by the Adi Gallong tribe of Siang District in Arunachal Pradesh (fig. 318). This is a general purpose carrying basket used by women for marketing. It is carried with a head-strap made from braided cane splits forming a long belt of uniform width (fig. 319). The basket may be woven from either cane splits or bamboo splits.

Size and Shape

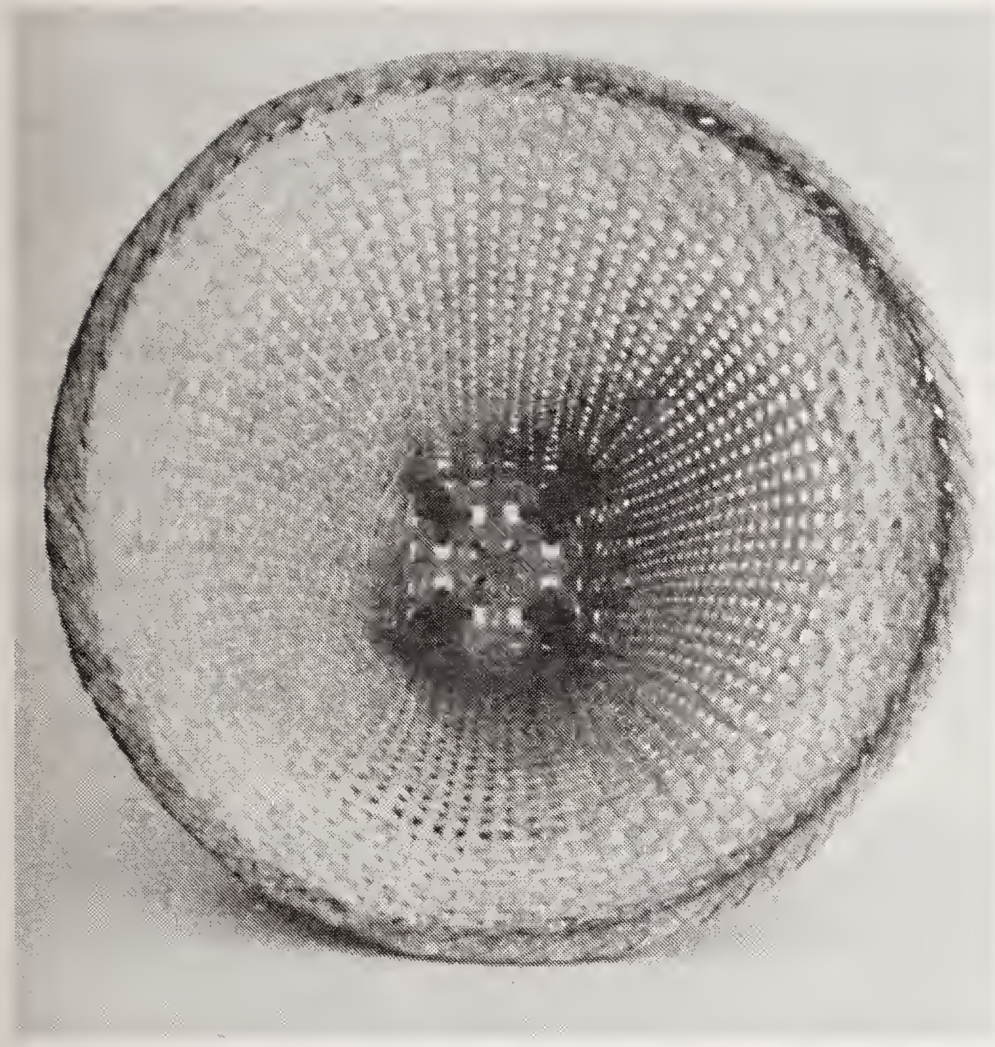
It has a small square base and square rim which has convex radii on its edges. The side profile is slightly convex. The diagonal of the base measures 100 mm, the rim diagonal is 340 mm and the basket is 420 mm high.

Base and Side Weave

The base is woven in a simple basket weave and the sides are made in the variation of the open-hexagonal weave which uses an additional horizontal space-filling element, converting each hexagon into two symmetrically opposed trapeziums (fig. 320). The difference in the size of the base and rim being large, additional inclined elements are necessary in the hexagonal weave. These are anchored to the horizontal binding element which spirals upwards.

Side and Base Strengthening

The base and side are strengthened by lengths of splits which weave into the side before passing under the base to weave up the opposite side. Four such strips are used in each direction and these are seen as parallel lines appearing and disappearing together as they are worked into the side weave. Under the base these strips form sets of mutually-perpendicular elements, each set weaving into the other in a simple basket weave. These elements do not interlace with the base weave but form a second layer below, thereby strengthening the base.



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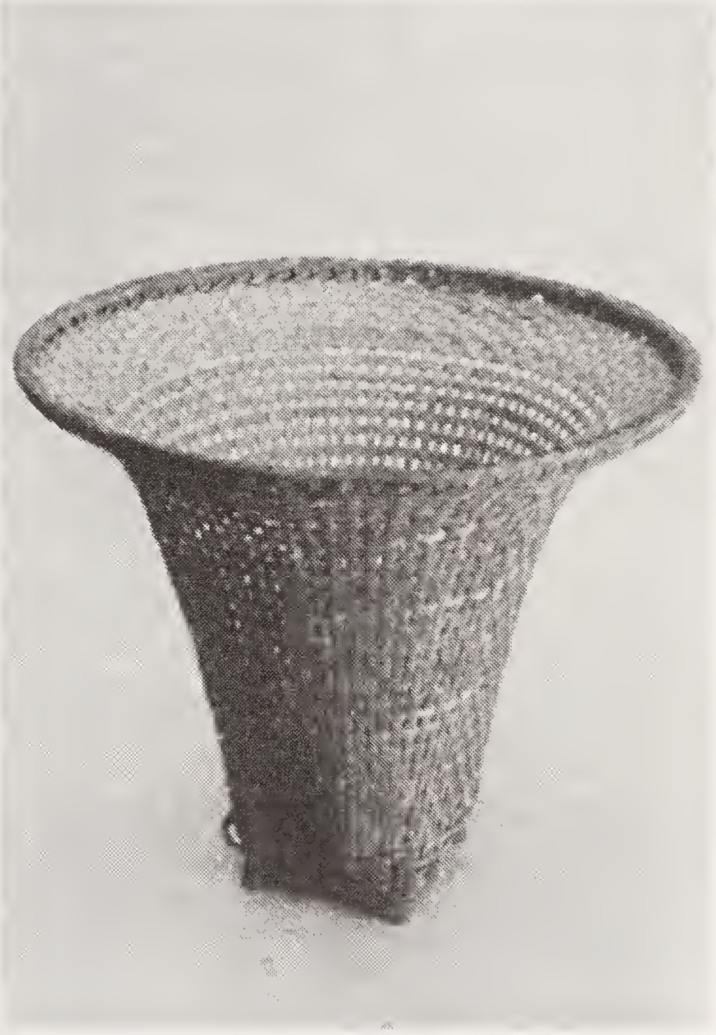


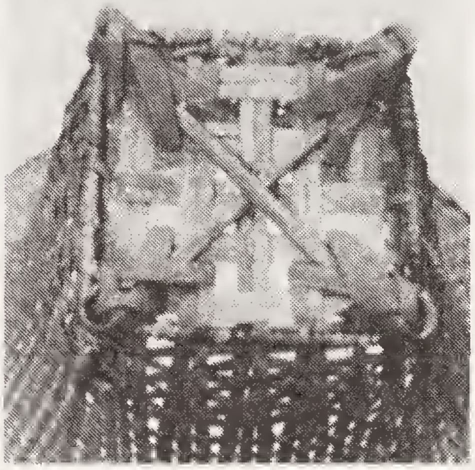
322

The perimeter of the base square is strengthened by a pair of cane strips twisted rope-like and locking both the base layers between twists. The side of the basket is further strengthened by thick bamboo splits which are bound to the side weave by split-cane binding and located at the corners of the base square. These splits extend slightly below the base to act as legs of the basket. Two braided cane rings are anchored to the side-strengthening elements near the rim while on the opposite side a loop made of twisted cane rope is held between two verticals near the base. These are used to fix the head strap to the basket.

Rim

The rim is bound by sandwiching the side weave between two rings of wide splits of bamboo. The split-cane binding is wrapped around a third ring at the upper edge before passing around the sandwiching elements and through the side weave (fig. 321).

The coarse version of this basket which is used for carrying firewood is locally known as *barsam.*



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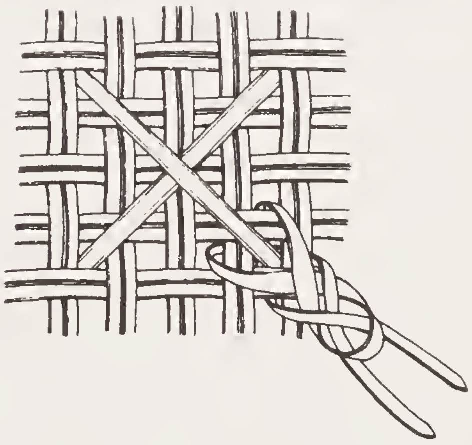


325

Khoru

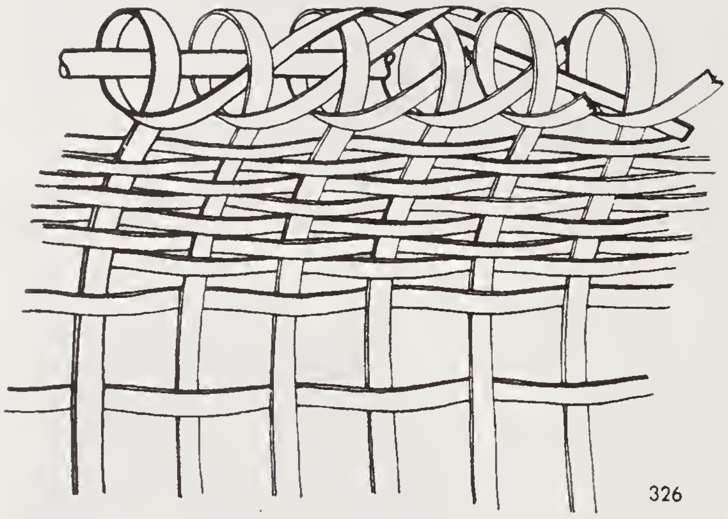
The *khoru* (the *u* is pronounced like the first *a* as in awake) is an unusual open-weave carrying basket. It is unusual because it is not constructed with the open-hexagonal weave; instead, the side weave is a simple basket weave made with gaps between consecutive warp and weft elements.

Size and Structure

The basket has a small square base of diagonal 160 mm, a large circular rim of diameter 400 mm and a height of 365 mm (figs. 322, 323). The basket is made entirely of bamboo outer splits except for a binding detail around its base where split cane is used. The square base is woven in a simple basket weave with elements taken in pairs and two sets of elements in a mutually perpendicular orientation. These elements extend beyond the base and bend upwards to form the vertical warp elements on the sides of the basket, which are spaced with uniform gaps between consecutive elements. The weft is formed by an element spiralling up the sides of the basket, weaving in and out of the warp, leaving gaps between consecutive turns. Additional warp elements are introduced so as to retain a uniform gap between elements in spite of the increasing diameter of the basket.

Rim and Other Details

Other interesting details in this basket are the leg and rim. Four legs are attached to the corners of the square base (fig. 324). Each one is made from an outer split of bamboo which is fairly thin but quite wide. The length of split taken is shaped so that the widest part is at the centre and it tapers towards both ends to less than half the original width. This split is bent so that the widest part forms an inverted truncated cone while the tapered ends form into a knot which interlaces the base weave before the loose ends are passed through the cone and tucked into the side weave (fig. 325). The rim is very neatly constructed by curling and interweaving the warp elements around a ring of suitable diameter, made of a thick split of bamboo (fig. 326).



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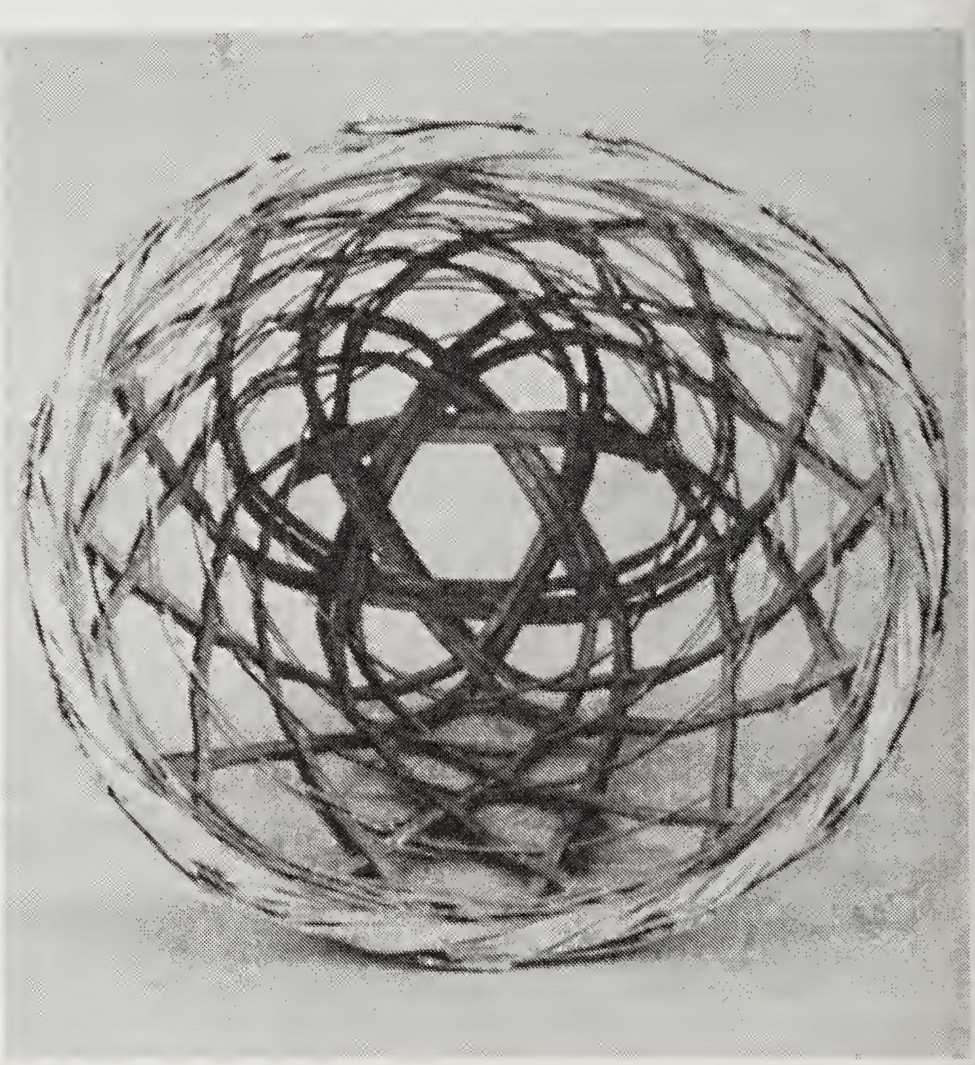

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Khasi Pig Basket

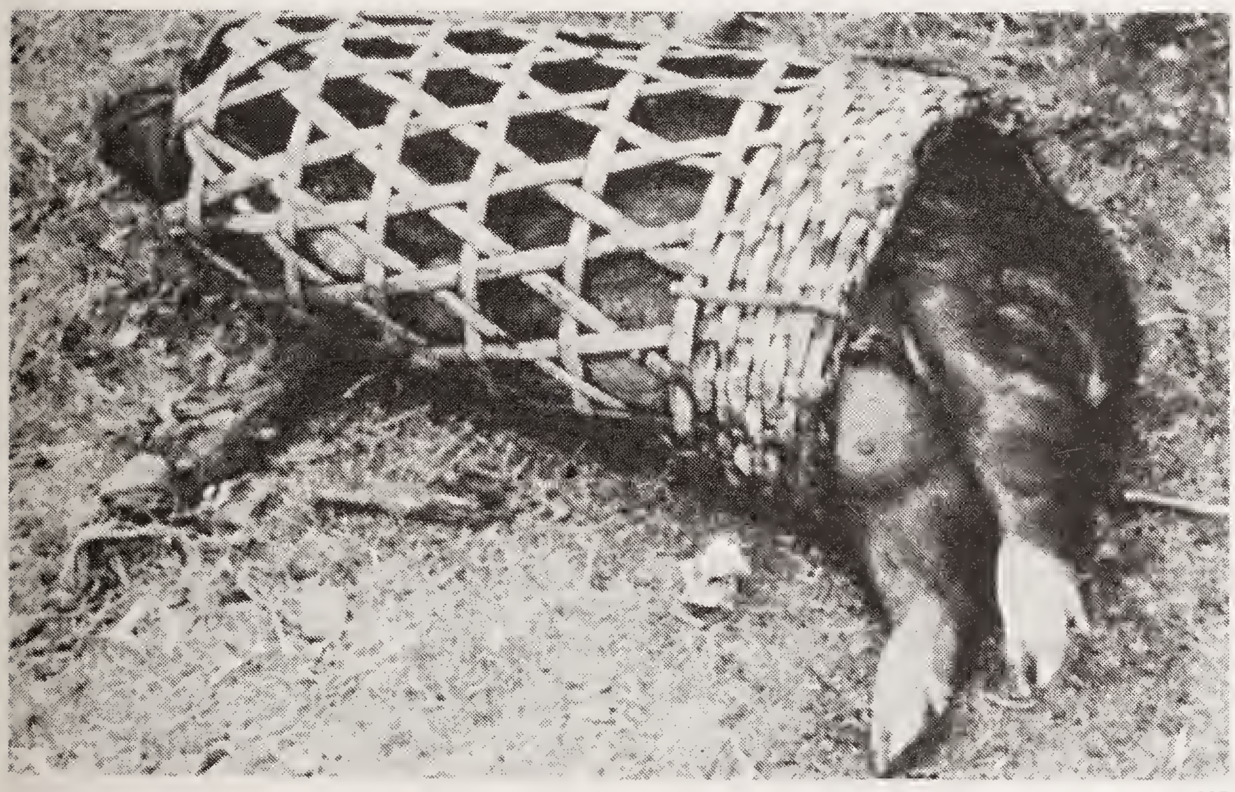
The "pig basket" as the name suggests, is a basket used to transport pigs. This was seen in use in the Khasi Hills, Meghalaya State. The local name is not known. Rather than the term "pig-carrying basket" the term "pig-packing basket" would express appropriately the manner in which this basket is used. Live pigs are restrained within the basket in order to facilitate easy transportation to the bazaar (fig. 327). After its forelegs are tied against its body, the pig is lowered into the basket head first so that its snout sticks out of the opening at the base of the basket and its hind portion protrudes above the rim. The pig's hind legs are bound together and the binding at the rim holds the animal gently but firmly within the basket.

Shape and Size

The basket is shaped like a test-tube, the diameter increasing gradually towards the rim. It is woven in an open-hexagonal weave using wide but thin outer splits of bamboo. The elements are fairly wide but thin — 10 mm in width and 1 mm in thickness. The diameter of the basket at the rim is 280 mm and it is 510 mm in height. This basket incorporates an extremely interesting structural concept. Elements used in the weave are taken in multiples and these work together to make the whole basket much stronger, just as in the famous *Panchatantra* story which illustrates the concept of strength inherent in unity.

Base and Side Weave

This basket is woven in two separate layers, each layer emanating from a common base structure. These layers are woven in an open-hexagonal weave, starting from a hexagon at the base such that each element in one layer has an identical and corresponding element in the other layer. The base hexagon is formed by six sets of elements stacked four deep (one on top of the other), each set defining one edge of the hexagon. The sets of elements lock into each other in a cyclic pattern and extend on both sides of each edge of the base hexagon. It is in the area outside the base hexagon that the layer differentiation takes place.



327

326: Detail of the *khoru* rim binding.

327: A live pig in a Khasi pig basket.

328: The clockwise and anti-clockwise movement of the elements as seen from above.

These form the inclined elements in the side of the basket as they are bent upwards from the base. When seen in plan, the elements extending outwards from one side of the edge of the base hexagon are inclined in a clockwise direction while those on the other side are in the opposite direction (fig. 328). Each of these forms two of the inclined elements in each layer as the elements which are stacked at the base separate and radiate up the side. An additional inclined element is introduced from the top, parallel to one of the inclined sets. Near the base this element is anchored before it weaves into all the inclined elements in an upward spiral, forming the horizontal element of the hexagonal weave.

Rim

At the rim the spiralling element is packed closely for several turns to create a strong edge. Above this point the inner layer is treated differently from the outer layer. The inclined elements of the inner layer are bent, twisted and interlaced to form a strong self-strengthened rim, whereas those of the outer layer are bent and tucked back into the woven band created by the closely-packed spiralling element at the rim.

The inner layer of the basket is completed first and the outer layer is woven tightly over this, using the formed inner layer as a mould. An interesting detail which is repeated in this basket is the manner in which stiff splits of bamboo are bent sharply without breaking the fibres in the element. This is achieved by twisting of the element from one side to the other where the sharp bend is desired till the fibres of the elements separate to make the split flexible at this point. This does not affect the property of the other parts of the bamboo split which retains its tensile strength.

All the tribes in the northeastern region seem to have understood this peculiar property of bamboo and use it in their products when required. The Lushais of Mizoram have coined a term which is derived from this phenomenon. The Lushai word is *sawp* meaning "bent or twisted but not broken", but the whole implication of the word as used by the Lushais is far deeper. They use this word in contexts other than those describing bamboo constructions but the analogy to this structural principle inherent in bamboo is evident.

329: The chicken basket from Assam.

330: A live chicken packed in a rough bamboo basket.

331: Riang chicken baskets.

Chicken Basket from Assam

This chicken basket is used in the plains of Assam for packing and transporting live fowls to and from bazaars (fig. 329). It is made from coarse inner splits in an open-hexagonal weave suggesting an economy of labour and material appropriate for its use. As it is intended for individual birds, it is fairly small.

Base and Side Weave

The base is woven in the semi-regular weave pattern consisting of hexagons and triangles, where the triangles appear on each edge of every hexagon. Once a sufficiently large base is established the elements are bent up to form the inclined elements of the side weave. The open-hexagonal weave of the side is completed by a horizontal spiralling element weaving in and out of the two layers formed by the inclined elements of the side weave.

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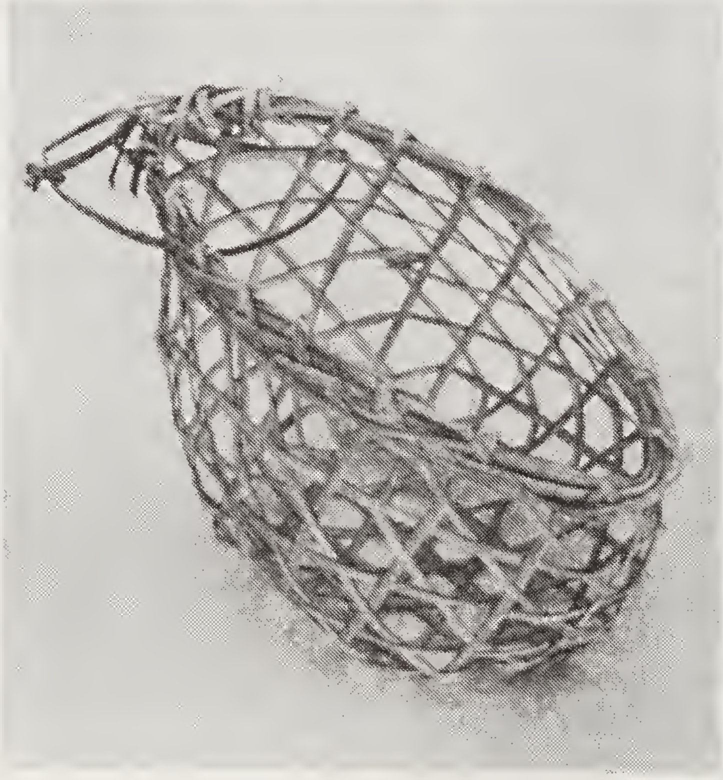

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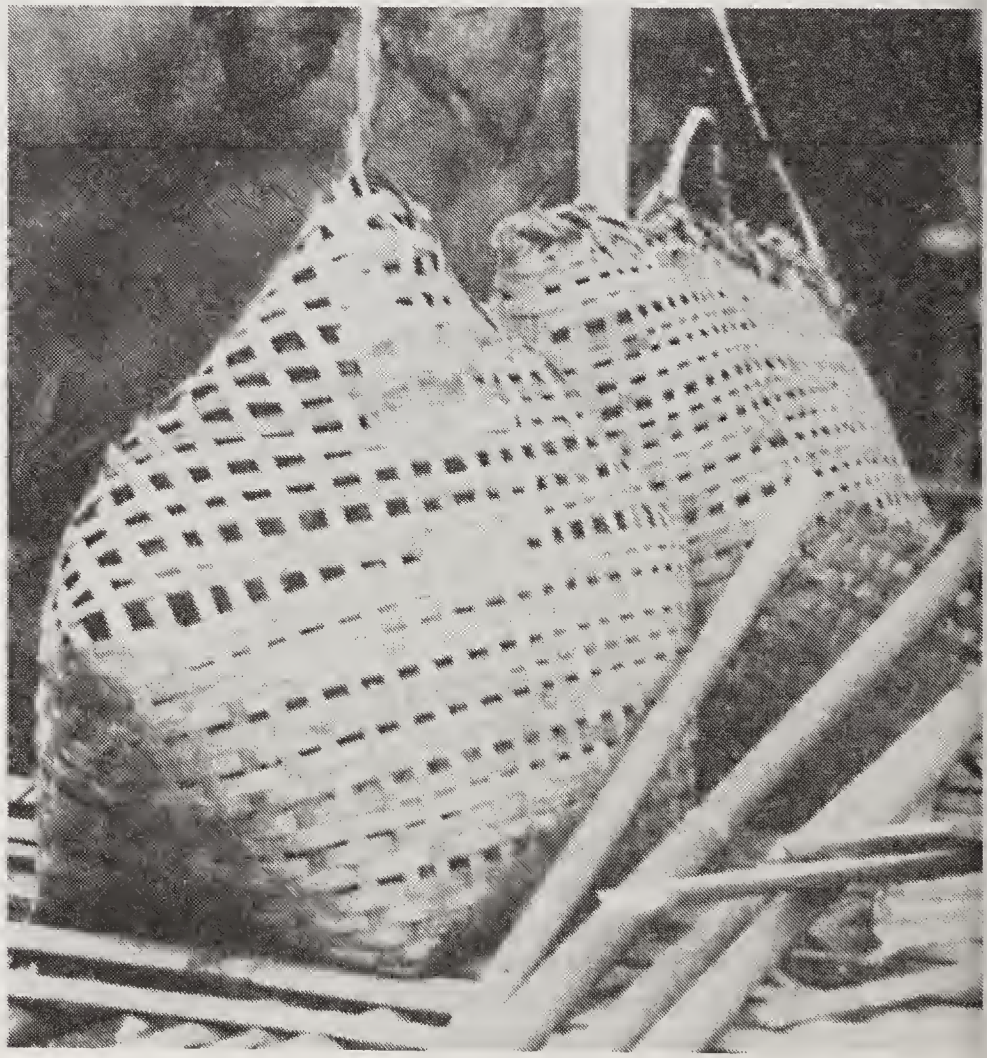

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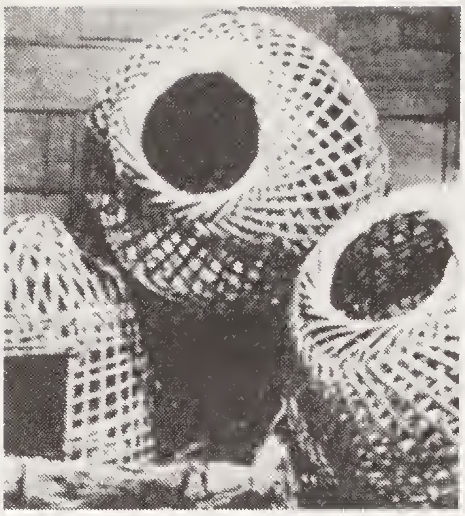
Rim

At the rim, pairs of inclined elements are twisted together to interlace with adjacent pairs, the movement being in one direction to form a self-strengthened rim. The shape of the rim at this point of construction is circular. This circular rim is deformed by bringing together two points on the circumference which are diametrically opposed. Simultaneously two other points on the circumference which lie on the diameter perpendicular to the previous ones are bent sharply so that the whole rim looks like closed lips. This lip is tied down, trapping the bird inside.

Other Chicken Baskets

Several other types of chicken baskets, intended for a number of birds together, are used in the region (figs. 330-332).



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332: Chicken baskets from Mizoram.

333: A grass basket from Assam.

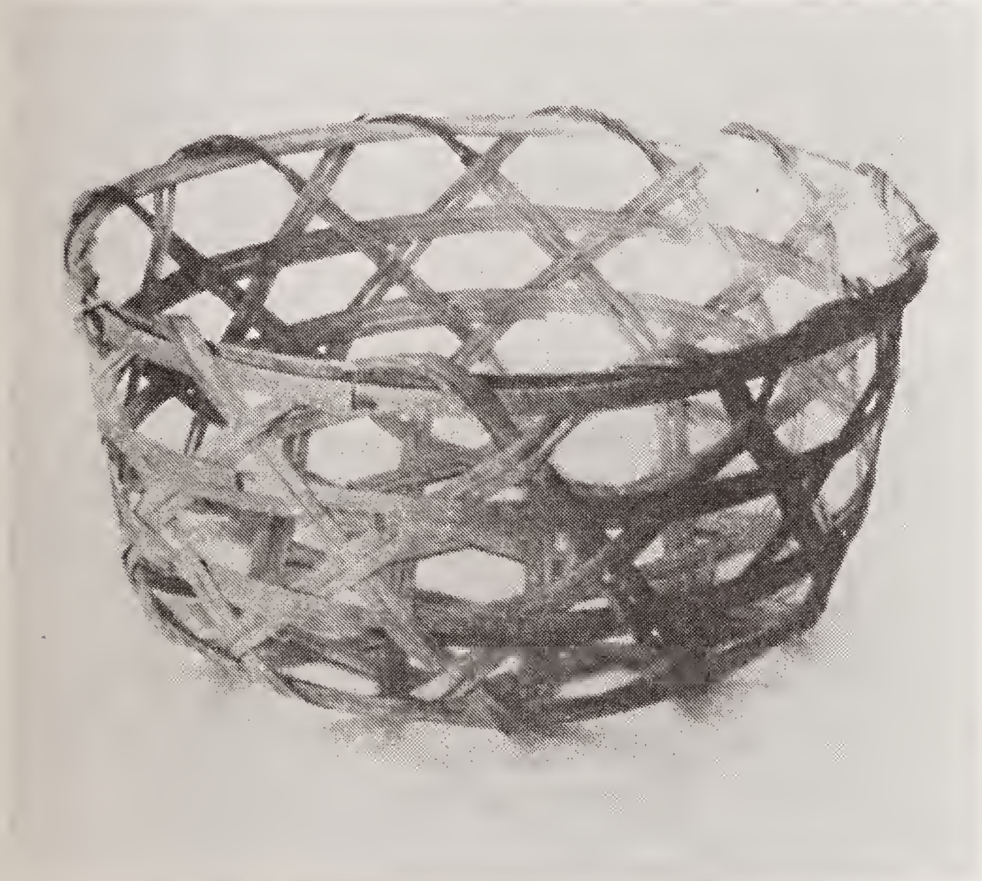
334: A geometrical diagram of the grass basket.

Grass Basket from Assam

This basket is used to carry grass for cattle fodder (fig. 333). It is made in the plains of Assam and this particular product comes from a village near Kharimganj in Cachar District. The basket may be carried balanced on top of the head or a pair of these may be suspended from a shoulder beam. It is also used for transporting clay pots and other produce to local bazaars. The basket is fairly large and quite strong.

Size and Structure

This is a shallow basket with a circular base and slightly wider circular rim. The diameter of the rim is 650 mm and it is 300 mm in height. The whole basket is woven in the open-hexagonal weave. The horizontal locking elements of the side weave are strong splits arranged as coaxial rings. The elements forming the inclined sets of the side and the sets of the base weave are formed by pairs of split bamboo, each 12 mm wide and 1.5 mm thick. The horizontal element is 15 mm wide and 2.5 mm thick. At the rim the inclined elements bend over a thick, strong horizontal band to become the element inclined in the opposite direction. The basket is simple and can be made quite quickly. Where the base meets the side a series of pentagons appear which permit the two-dimensional hexagonal weave of the base to move into the third dimension in the sides (fig. 334).



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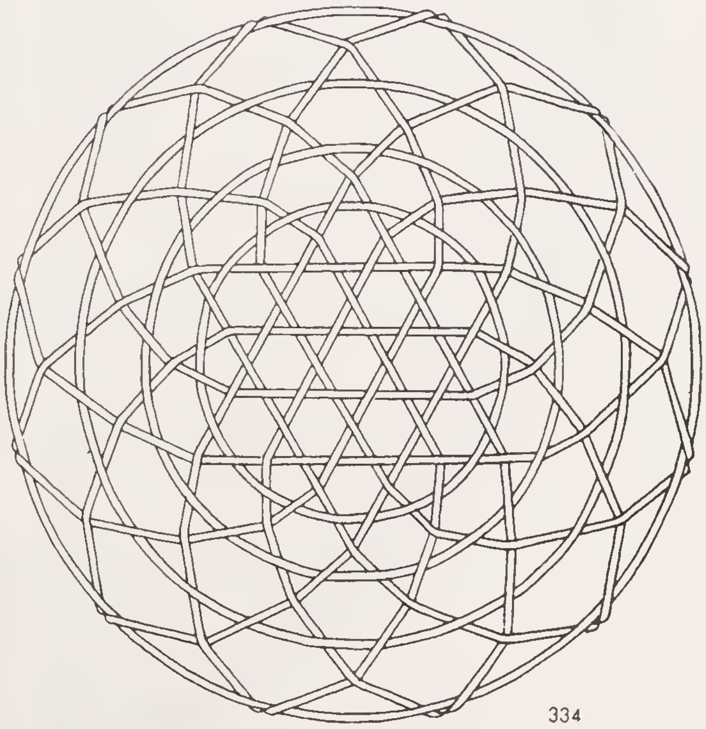

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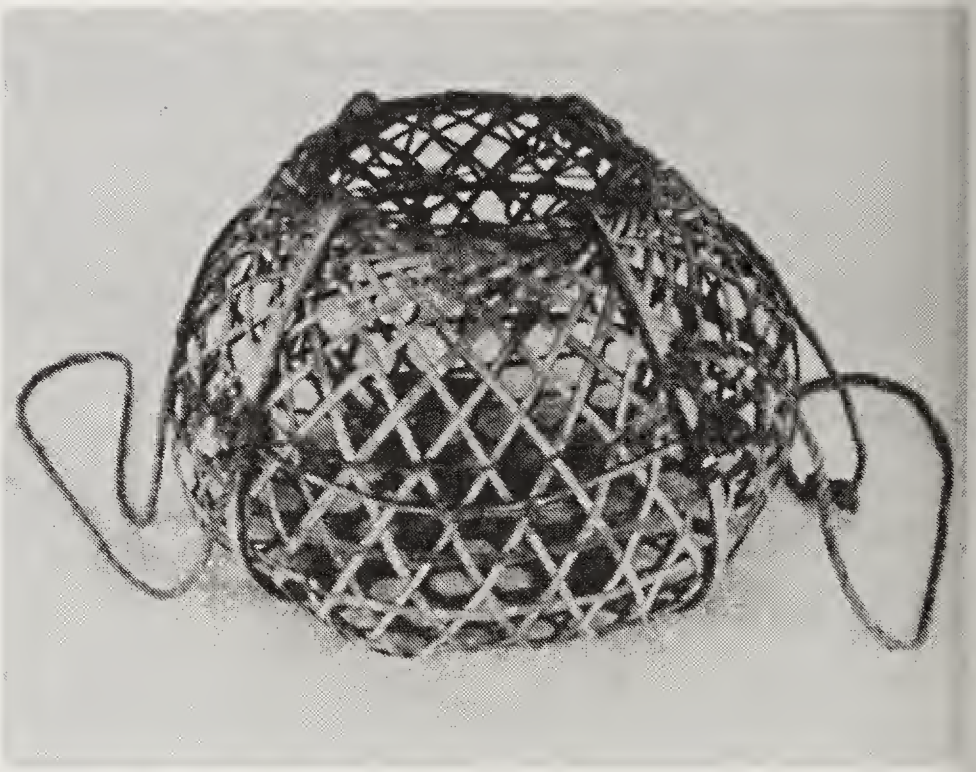
335: An egg basket from Assam.

336: The base and cutaway view of the top of the egg basket as seen from above.



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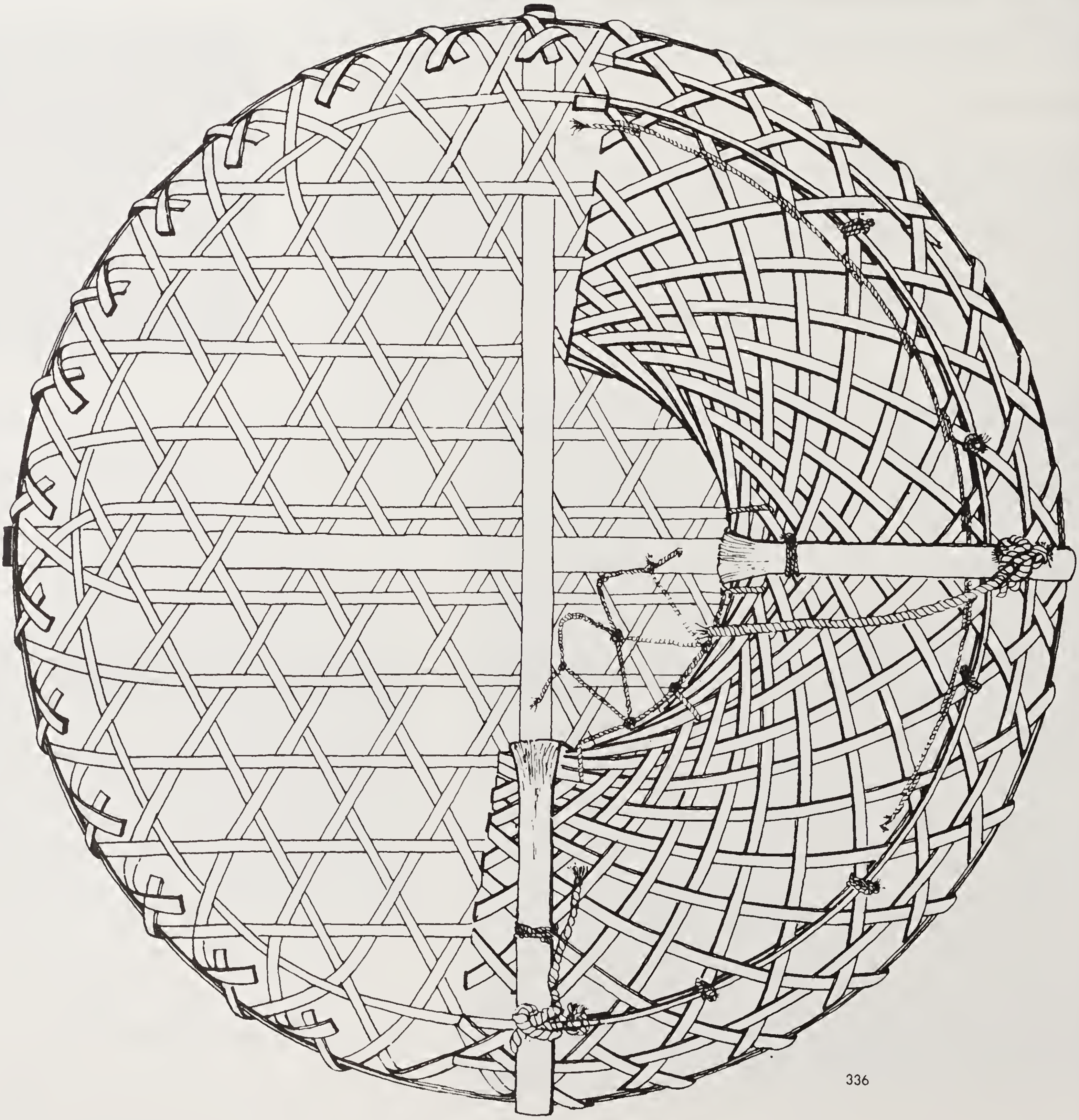

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Egg Basket from Assam

This basket is used in the plains of Assam to pack and transport eggs. This particular example was acquired from Lumding in Central Assam. It has a spherical form, flat at the base with a small circular opening at the top (fig. 335). The circular opening is cleverly closed by a net made of thin fibrous rope which can be laced at the centre. The basket is hung from four ropes, knotted to the basket to form a loop at the top, so that it can be carried on a shoulder beam. This rope also acts as the handle when carried by hand. Eggs are packed within the basket over layers of hay. The structure is extremely strong and all major elements use strong outer splits of bamboo.

Base and Side Weave

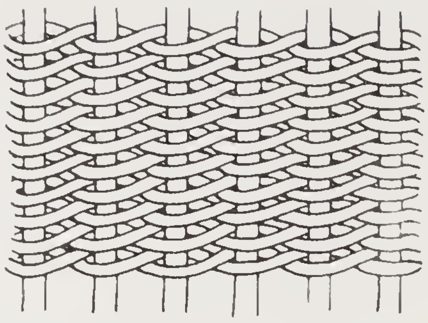
The base is woven in an open-hexagonal weave formed by interweaving three sets of parallel elements. These elements extend from the base on all six sides and bend upwards to form the inclined elements of the side weave (fig. 336). Each of the elements in the base hence provides two of the inclined elements, each located on opposite sides of the basket and inclined in opposite directions. In the side weave, the rhombic structure created by the two sets of overlapping inclined elements are locked in place by a series of coaxial rings, each weaving in and out of these layers. This generates the open-hexagonal weave. The coaxial rings are used to about the half the height of the basket. Above this the rhombic structure resulting from the sets of overlapping inclined elements is retained upto the rim, the sizes of the rhombii reducing progressively. In this part, one set of inclined elements of the side weave interlaces with the set inclined in the opposite direction to create one woven surface.

Rim and Other Details

All these elements pass at the rim so that they are tangential to the circle formed at the rim. These elements interweave to form a strong self-strengthened rim, generating an interesting cyclic pattern. The body and base of the basket is further strengthened by two strong splits of bamboo, each bent to follow the profile of the basket. Each strengthening element passes from the rim, down the sides of the basket on the outer surface, before passing the weave, to lie on the inside surface, at the base of the basket. Both splits cross each other at right angles at the centre of the base. The open ends at the rim are bent sharply around the edge to extend a short distance inside the basket, to form a second layer. Both layers on each open end are bound together sandwiching the side weave. The sharp bend in this thick element is accomplished by pounding the bamboo split at the desired point with a heavy hammer, so that the individual fibres of the split are sufficiently de-bonded to create the flexibility necessary for the bend.

Closed-Weave Carrying Baskets

Several types of closed-weave baskets are made in the northeastern region. The different weave structures employed in the base and sides of these baskets are fairly closely packed so that there is no gap (or extremely small gaps) between elements woven into the basket (figs. 337-340). These carrying baskets are primarily intended for transporting grains and other field produce, which is why the weave structure has to be close.



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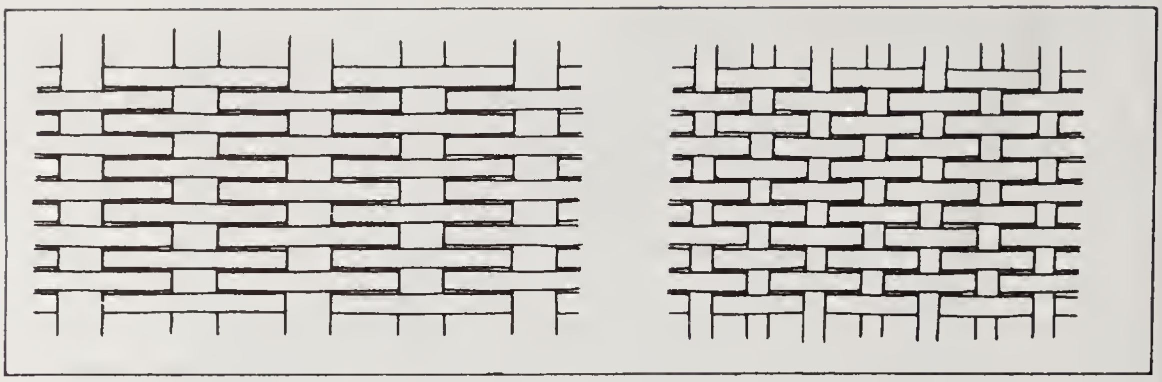

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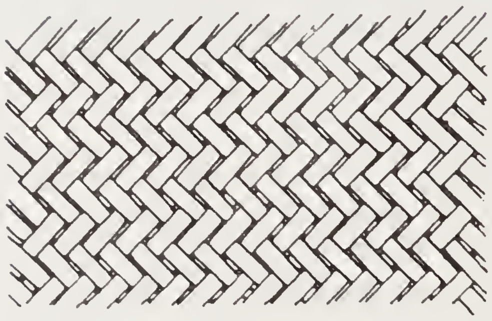

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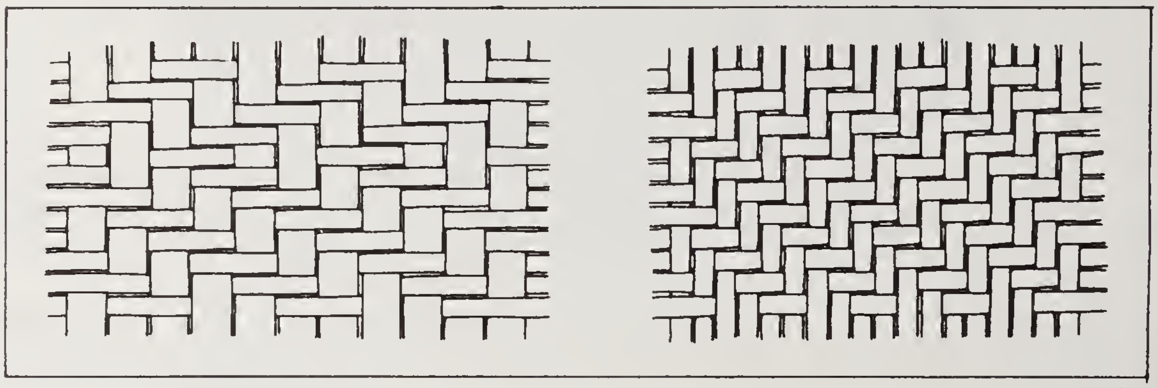

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337: Variations in the tabby weave used in the closed-weave baskets.

338: Variations in the twill weave used in closed-weave baskets.

339: Twining, another method of constructing closed-weave baskets.

340: The plaiting method of making closed-weave baskets.

Shape and Structure

The weave elements can be either fine or coarse, but the width of these elements is always greater than their thickness. The elements used in the warp are sometimes wider than those of the weft; more often, however, they are of approximately the same dimension. There are three main base-shapes in these baskets. These could be a square or rectangular base, a circular base, or a conical base ending in a sharp point—the last two being fairly similar in construction.

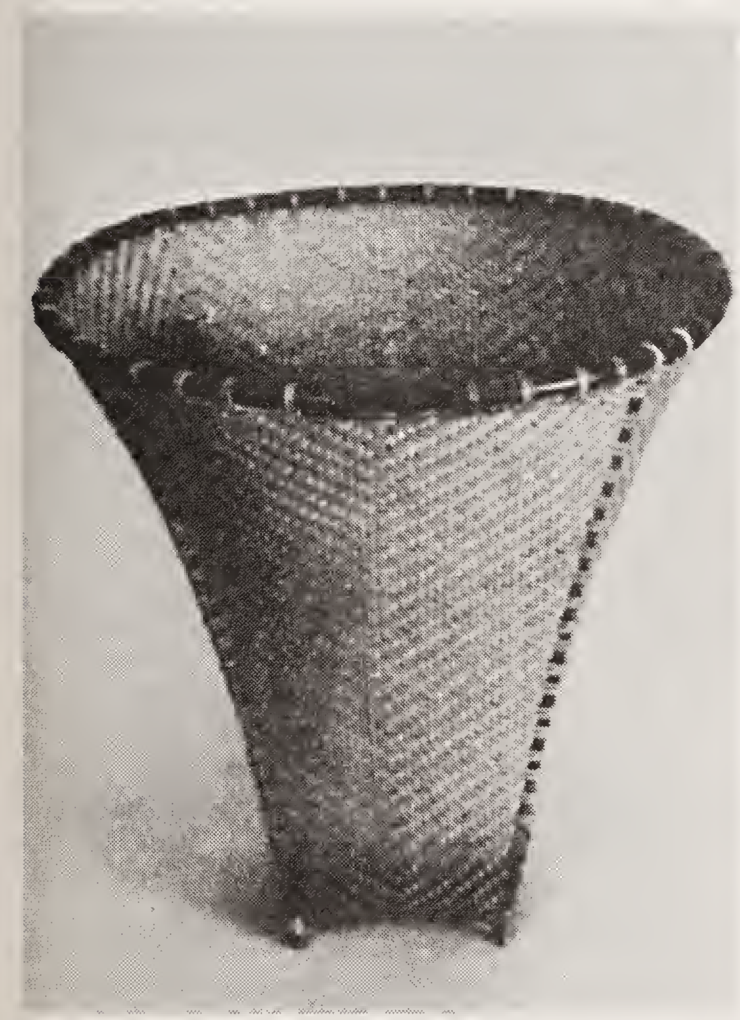
Square-Based Baskets

The square or rectangular base is derived from either one of two basic weave orientations. The first type is where the two sets of elements forming the warp of the basket interweave in a mutually perpendicular configuration, each set being parallel to the *sides* of the square or rectangular base (fig. 258). The second type is where two sets of elements are woven in a mutually perpendicular configuration, each set being parallel to the *diagonals* of the square base (fig. 259). In the former, the strips forming the base are bent up to become the warp, i.e., they lie vertically around the circumference of the basket, before additional splits are woven horizontally in a tabby or twill weave. The twill weave and its variations predominate. Here, both the warp and weft elements are of uniform thickness. However, the width of the weft element in some cases varies, depending on the part of the basket that they comprise.

For example, in the Riang basket, the weft elements used in the sides of the basket near the base are wider than the warp. A large portion of the side above this point is woven with weft elements of the same width as the warp and near the rim the weft elements are progressively thinner. These changes in the width of the weft elements create strongly differentiated textures, occuring as horizontal bands around the basket, one above the other. In the latter case, where the base elements are woven parallel to the diagonal of the base square, no additional horizontal element is used in the side weave. Here the elements extending out of the base square are bent upward, one set weaving into the other, with each set moving up the sides of the basket at a sharply-inclined angle. Hence the two sets of elements are inclined in the opposite direction, and neither is along the vertical axis with respect to the basket.

Circular and Conical Based Baskets

Baskets incorporating the circular or sharply conical base forms are constructed with all the warp elements overlapping at the centre of the base, before they extend radially outward and upwards to become the basic structural elements of the base and sides of the basket. The difference in construction between the circular and sharply conical based baskets is that the warp elements in the former extend outward from the centre, radially for some distance, before they are turned up to become the elements of the side weave. In the latter case, this bending upwards of warp elements starts very near the centre. The weft element in both these cases, is a separate horizontal element which spirals outwards and upwards, simultaneously weaving in and out of the verticals. In most examples of this type the warp elements are bigger and stiffer than the weft element.



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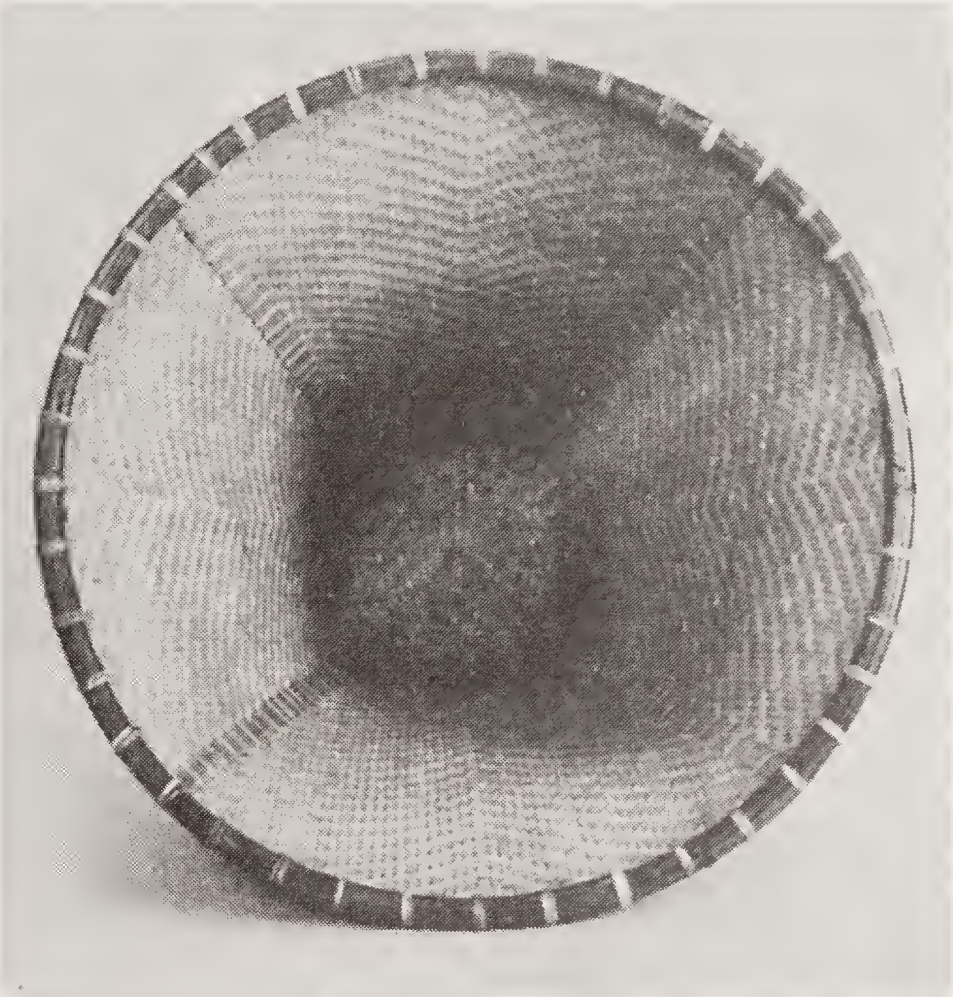

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341: The *paiem*, a Lushai basket.

342: The *paiem* as seen from above.

Paiem

The *paiem* is a closed-weave carrying basket used by the Lushais of Mizoram to carry grain and other field produce. In Lushai, the word *em* means basket and *pai* means "without holes". This basket is also called *empai* (fig. 341). The Lushai women also use this basket for marketing. It is made from bamboo outer splits from a species locally called *rawnal.* Split cane is used in the rim-strengthening element, the weft elements of the side weave near the base, in bindings at the rim and for strengthening the corners of the basket. The cane species used is locally known as *mitperh.*

Shape and Size

The basket has a square base whose diagonal measures 200 mm and the cross section of the basket goes through a gradual transition till it reaches a perfectly circular rim of diameter 410 mm. This transition takes place over a height of 430 mm (fig. 342).

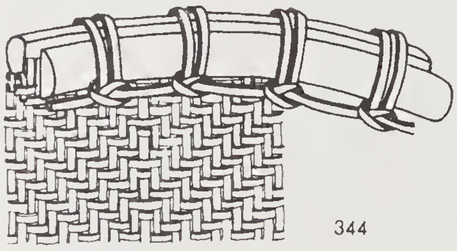
Base and Side Weave

The square base is woven with two sets of mutually perpendicular elements, each parallel to the sides of the base square. The elements extending beyond the base square on all sides are bent up to form the warp elements on the sides of the basket. The base is woven in a herringbone-twill pattern, with the herringbone pattern radiating from the centre of the base towards the sides of the square. The herringbone pattern extends up each side of the basket. Each line in the pattern, on one side of the basket, meets the corresponding line on both adjacent sides. This generates a wave-like movement of the pattern around the basket.

While weaving this basket, the Lushai craftsmen employ simple jigs to control its shape and size. After completing the base square, the side-strengthening elements are held upright at the corners of the square base and these elements are held together by a temporary ring made of split bamboo. The diameter of this ring corresponds to the diameter of the basket. These side-strengthening elements are taken in pairs, one of thick bamboo split shaped to a triangular cross-section appearing on the outside surface and the second split, thin but wide, appearing on the inside surface of the basket.

343: Detail of the binding at the corner of the base.

344: Detail of the rim binding.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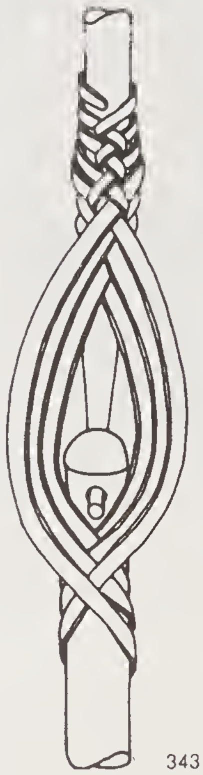
The horizontal weft element, in the side weave, forms a spiral moving from the base to the rim. The weft elements on reaching each pair of side-strengthening elements, weave in a sequence such that one weft element passes under the inner strengthening element, three subsequent ones pass between the two layers of strengthening elements and the next two pass over the outer strengthening element. The sequence is repeated from the base to the rim, thus incorporating the vertical strengthening elements as an integral part of the side weave.

Additional warp elements are introduced in the side weave, as the diameter of the basket increases, and these are always added near the side-strengthening elements, with its lower end tucked between the two layers of the side-strengthening elements. This ensures that the inner and outer surface of the basket remains uniformally smooth and even-textured. The base is strengthened by two stiff bamboo splits, each rounded and shaped like spindles. These splits lie diagonally across the base square and are stitched into the base weave, near the corners, before the ends of these splits are housed in circular holes, burned into the side-strengthening elements with a red-hot metal poker.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Rim and Other Details

The corners of the basket are strengthened by split-cane bindings that are tied around the base-strengthening and side-strengthening elements (fig. 343). The side-strengthening elements extend slightly below the base to form the legs on which the basket rests. The rim is strengthened by sandwiching the edge of the side weave between two rings made from half cane splits and these are bound together by split-cane bindings (fig. 344). All elements made from cane are smoked to a rich red-brown colour before they are used in the basket.

Tlamen

The *tlamen* is a Lushai product, larger than the *paiem,* which is carried by men to bring in produce from the fields (fig. 345). The basket has a square base and circular rim.

Size and Structure

The diagonal of the base square is 210 mm and the sides flare outwards sharply to a rim diameter of 520 mm. The height of the basket is 520 mm. The structure and method of constructing this basket is identical to that of the *paiem.* However, far coarser strips of bamboo are used in both the warp and weft. An interesting variation in this basket is the use of smoke-darkened splits of bamboo for a few selected warp elements, creating a series of strips down each side of the basket.

Dawrawn

The *dawrawn* is another closed-weave carrying basket used by the Lushais, both for storage as well as to bring in field produce (fig. 346). This basket is made in two sizes, the men's size and the women's size.

Size and Structure

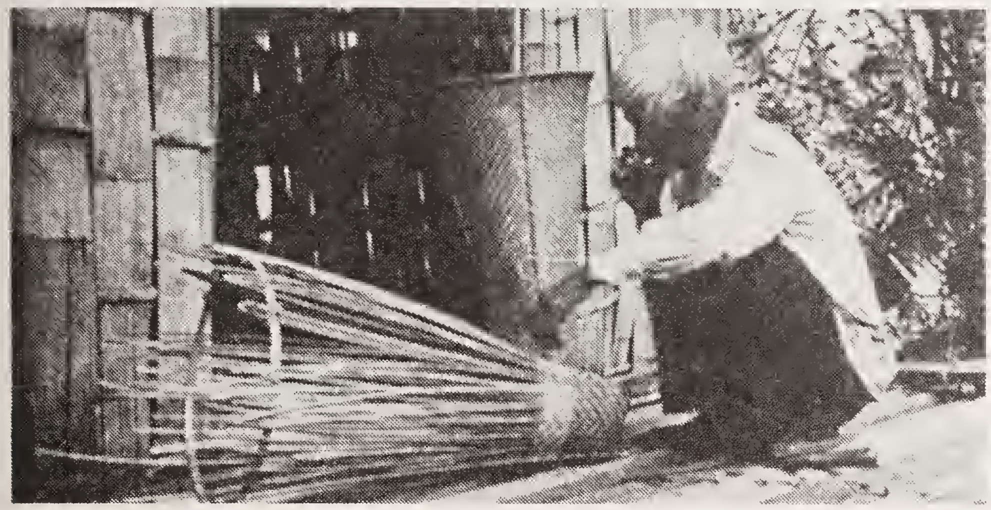
It is a tall, narrow basket with a square base and circular rim. The diagonal of the base square measures 190 mm, the rim diameter is 420 mm and its height 740 mm. The structure and method of construction is identical to that of the *paiem* (fig. 347), except that slightly coarser strips are used for the warp and weft elements (fig. 348).

345: The *tlamen*, used by the Lushai men.

346: The *dawrawn*, another Lushai basket.

347: The detail of the base corner strengthening is the same as that of the *paiem*.

348: A Lushai craftsman making a *dawrawn*.



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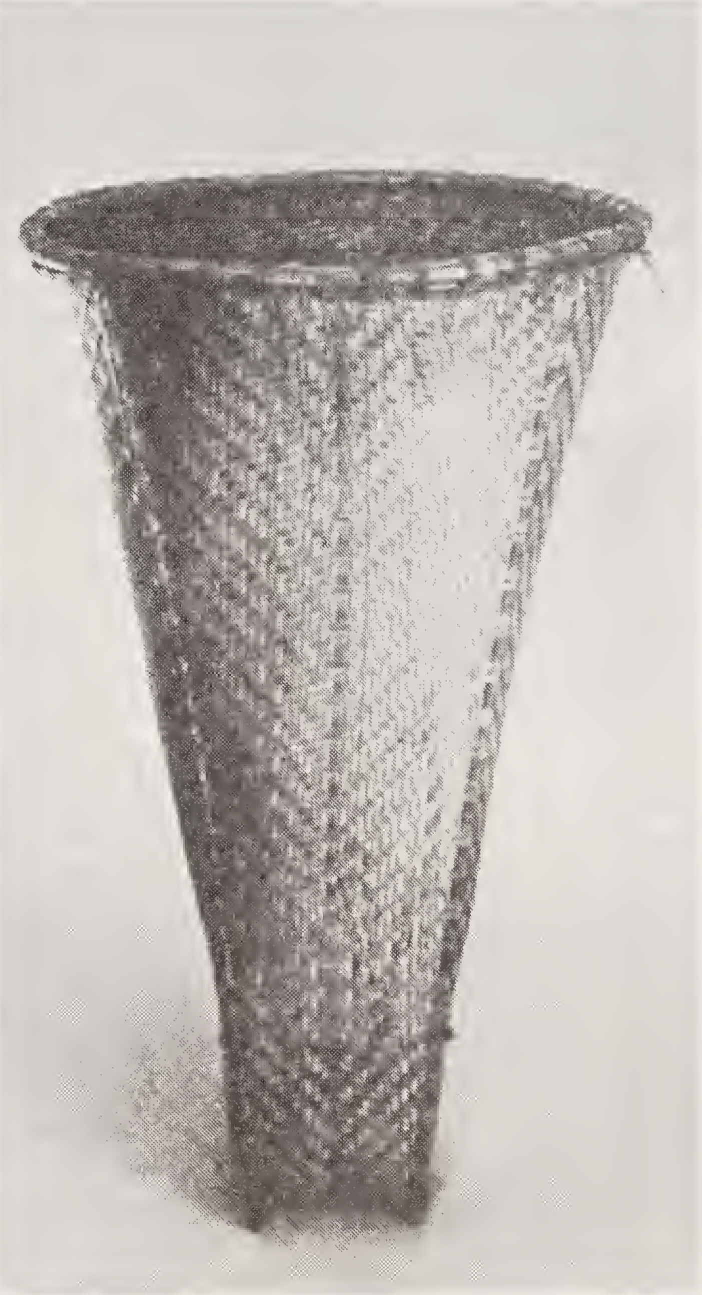

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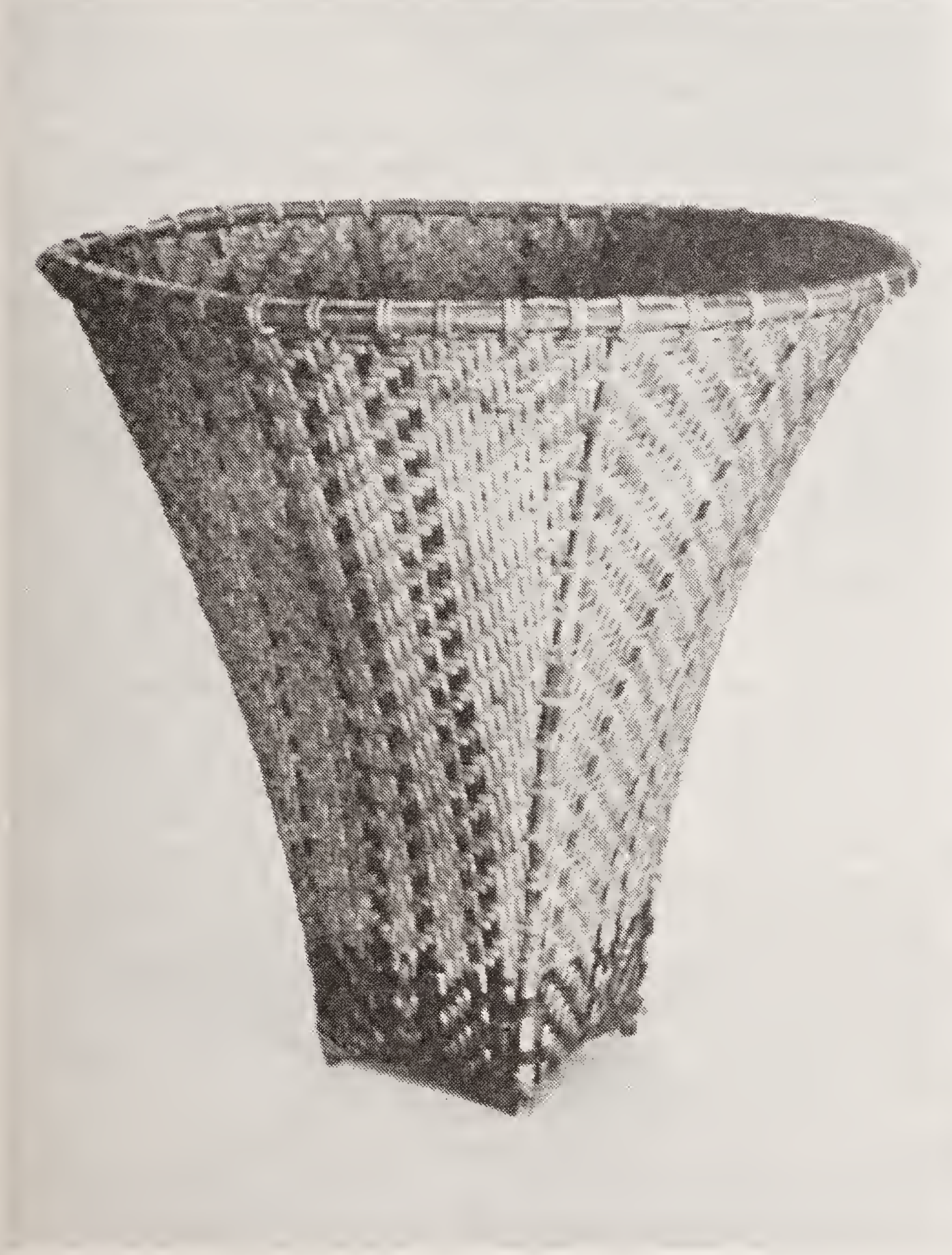

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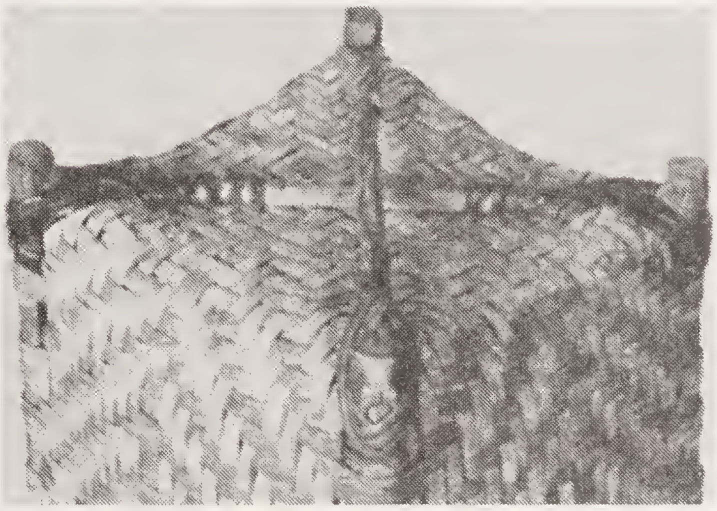

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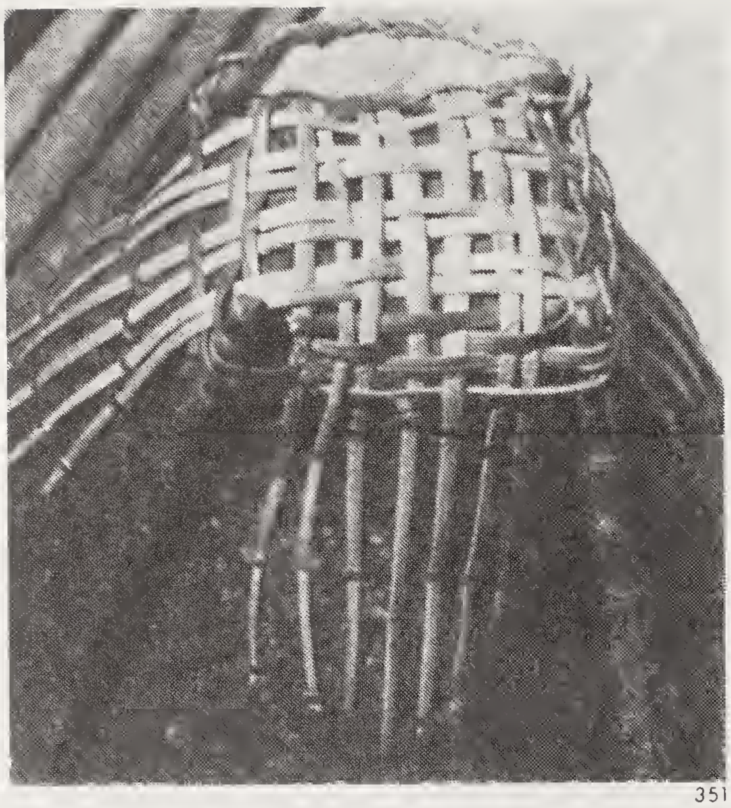

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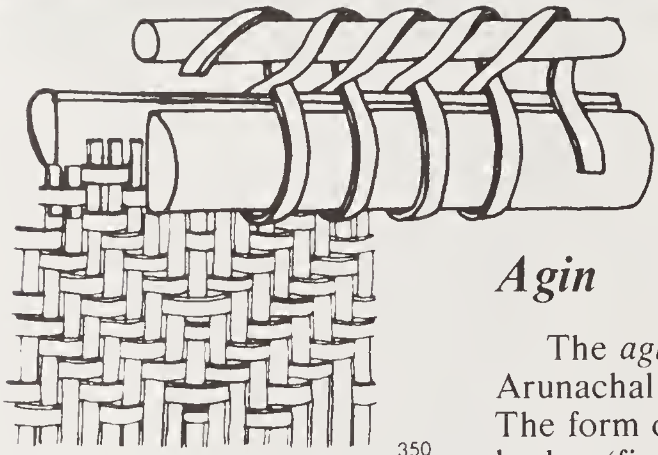

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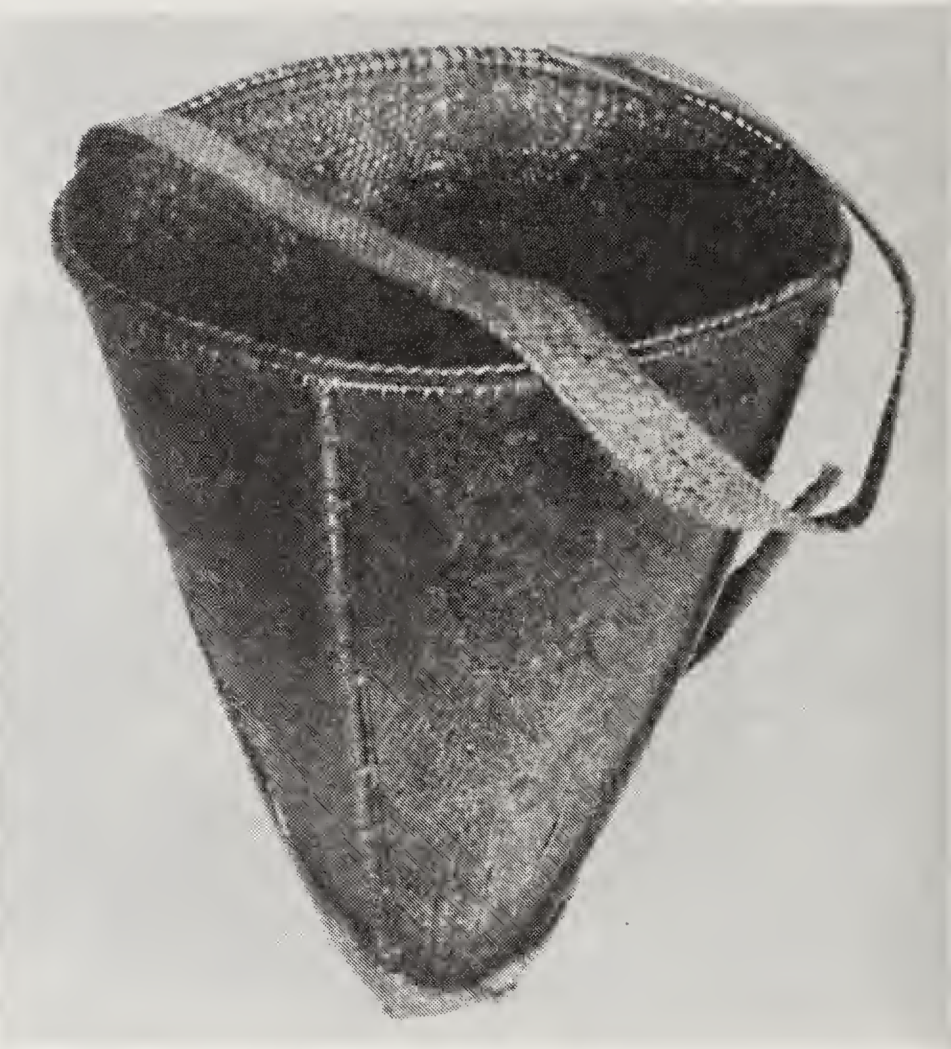


349

349: The *agin*, an Adi Gallong basket.

350: Detail of the rim binding.

351: Detail of the strengthened base.

Agin

The *agin* is a closed-weave basket used by the Adi Gallong tribe of Arunachal to carry grain and for general purpose marketing (fig. 349). The form of this basket is similar to the *barsi,* open-weave Adi Gallong basket (fig. 318).

Size and Structure

The *agin* has a square base of diagonal 70 mm widening up to a rim shaped like a square with radii on each side. The diagonal of the rim square measures 310 mm and the height of the basket is 410 mm. The basket uses bamboo splits as the primary construction material, while split-cane is used in the binding details (fig. 350). The base, side and rim-strengthening constructions are identical to that of the *barsi* (fig. 351).

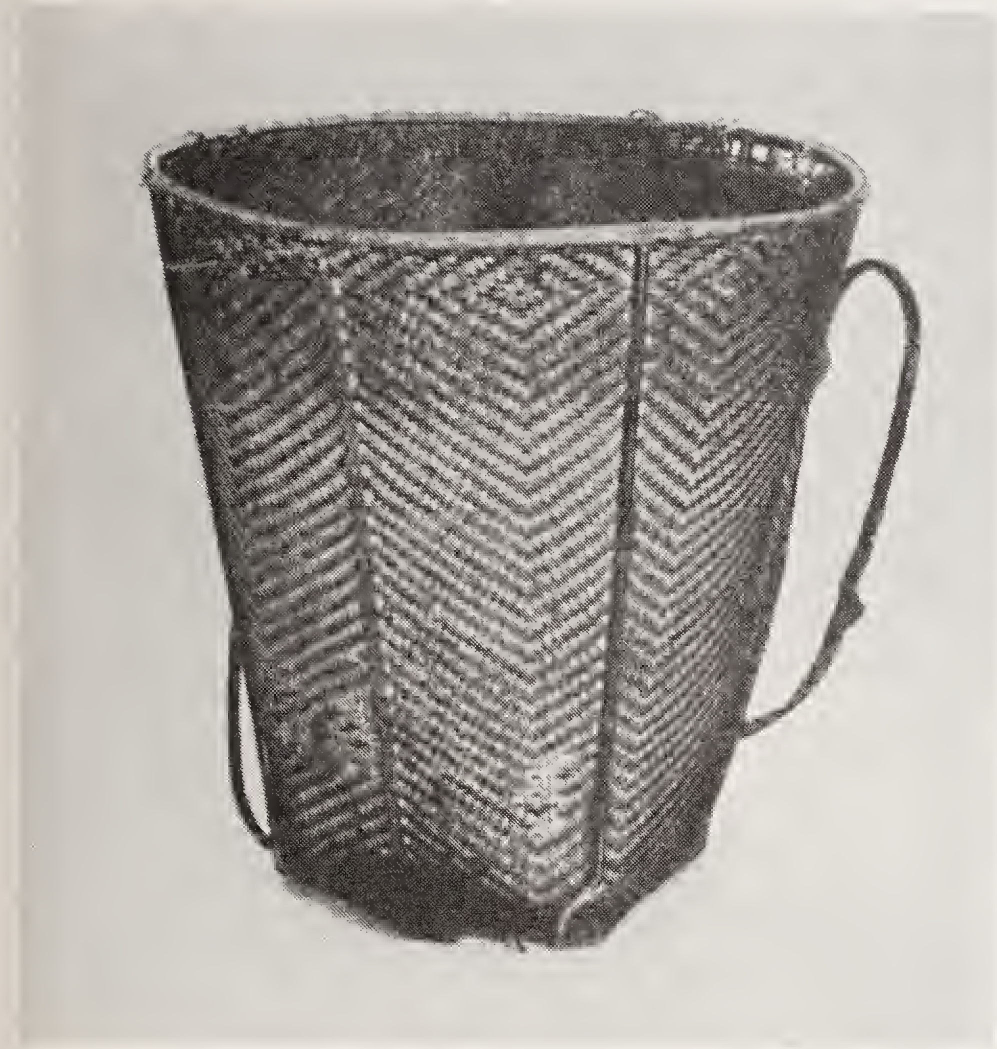
The main warp element of the side are at first interwoven to form the small base. The sides are then woven in an inverted herringbone-twill pattern, repeating twice on each side, symmetrically on both sides of the centre line. The warp and weft elements are made from uniform fine splits of bamboo. Additional warp elements are introduced to accommodate the upward expansion of the basket. These are always located on both sides of the centre line. The whole basket has a dark brown colour due to prolonged smoking, and it is stored over the fireplace between use.

Khan

The *khan* is a closed-weave basket used by the Khiamngan Naga tribe living in villages east of Tuensang (fig. 352). It is used to carry rice and other grains from the fields. The basket has a square base, with the sides tapering outwards in an almost straight line to a large circular rim.

Size and Structure

The diagonal of the base square measures 260 mm, the diameter of the rim is 410 mm and its height is 430 mm. The warp elements used in the sides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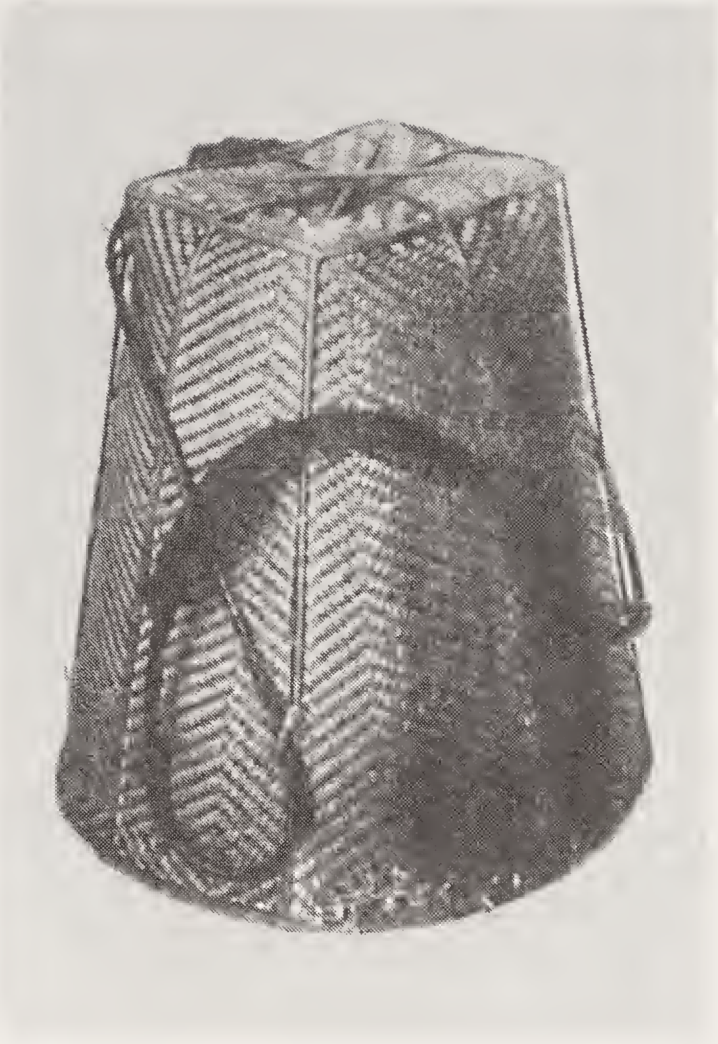
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352: The *khan*, a Khiamngan Naga basket.

353: The *khan*, resting on its rim.

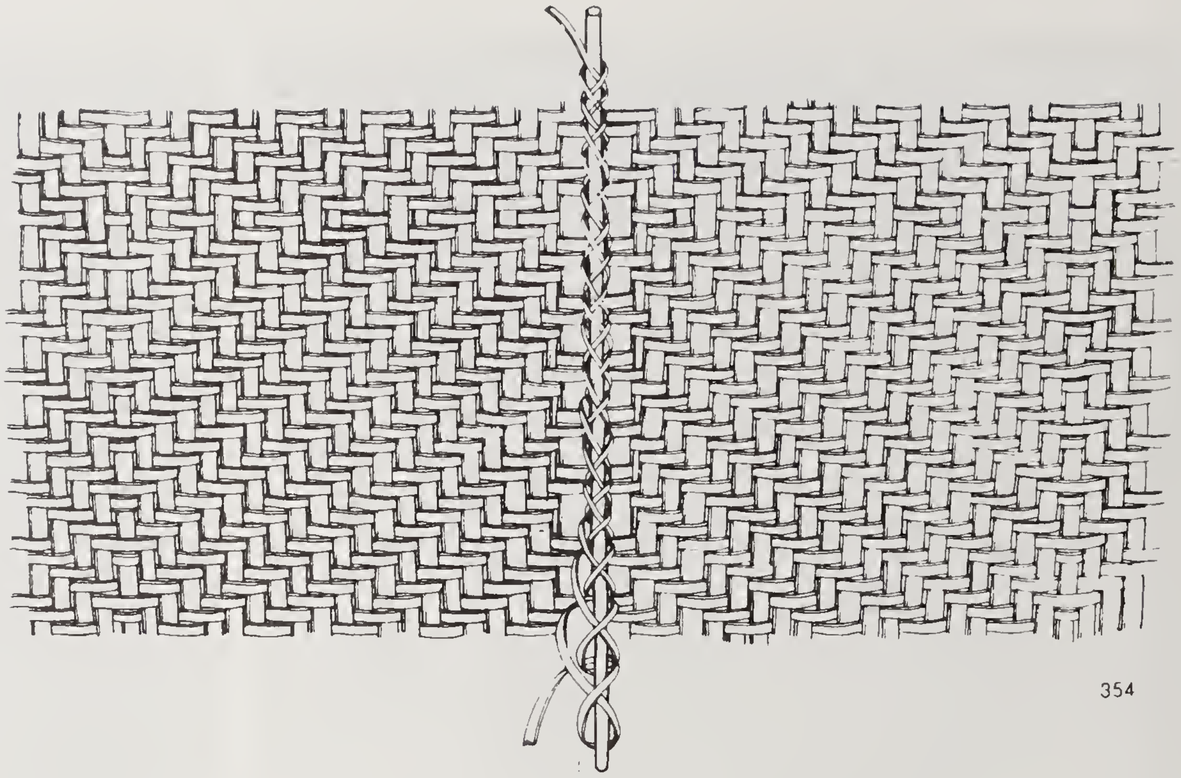
interweave to form the base of the basket. This is woven in a herringbone-twill pattern, which radiates from the centre to the sides of the base square. At this point, the warp elements extending beyond the base square are bent upwards, and a continuous spiralling weft is interwoven in a reversed herringbone-twill pattern. This generates concentric diamond patterns at the centres of each edge of the base square (fig. 353). In a similar way diamond patterns are generated in the weave just below the rim.

Surface Finish

Bamboo splits of uniform width and thickness are used in both the warp and weft. The former uses bamboo outer splits, while in the latter the hard outer skin is scraped off with a *dao*. This selective surface treatment results in dramatizing the weave structure, when the finished product is subjected to prolonged smoking over the fireplace. The exposed inner layer of bamboo used in the weft achieves a much darker brown than the warp elements which have the smooth outer layer retained, thus enhancing the graphic quality of the weave structure.

Rim, Base and Side Strengthening

The rim is strengthened by two rings made from half cane splits which sandwich the side weave and these are bound by split-cane binding. The sides of the basket are strengthened by stiff bamboo splits (fig. 354). Here two sets are used. One is located vertically at the corners of the square base, extending from the base to the rim. The other set passes over the centre of one side and bends to pass across the base and then move up the other side. Two such strips cross at right angles in the centre of the base. The perimeter of the base square is strengthened by a pair of split-cane rings bound together by split-cane binding. At the point where this ring meets all the vertical-strengthening elements, the pair of elements forming the rim parts sufficiently to receive the vertical elements, which have been previously thinned to form a tennon-like end. The base weave of the basket is further strengthened by two thick bamboo splits which have been shaved and rounded. These splits are tucked into the base weave at the corners forming the diagonals of the base square.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354: The side weave and strengthening element.

355: The *longkhai*, a Dimasa Cachari basket.

356: The *longkhai* as seen from above.

357: A craftsman finishing the edge of the *longkhai*.

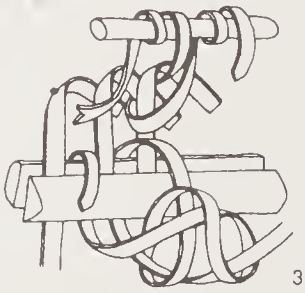
358: A semi-finished rim as seen from the outside.

359: Detail of the rim binding.

360: The cross section of the strengthening rings and the movement of the cane split used for binding.

361: Detail of the side strengthening element at the rim.

362: The side-strengthening element is partially split into a number of layers to make it pliable where necessary.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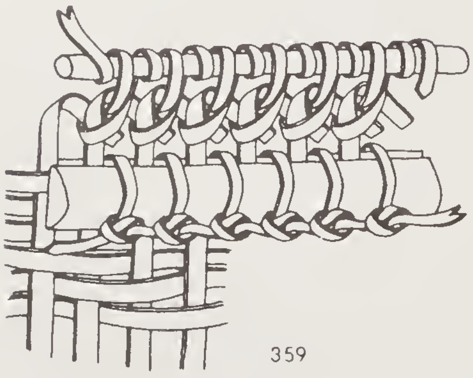
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Braided Head-strap

Loops made from cane binding are provided on the strengthening elements to receive the head-strap, which is braided from lengths of bamboo split. The braiding is very interesting, as it takes different forms in the part that rests on the forehead and the ropes that support the basket at the back of the carrier. The head-strap is a long single unit. At the centre, nine elements are joined in a multi-directional braiding to form a flat band, and at each end of the flat portion the braid is transformed into a hollow rope-like structure. The ends of the rope-like braided parts are knotted together at the back of the basket after each end passes through a pair of loops.

Longkhai

The *longkhai* is a closed-weave carrying basket used by the Dimasa Cachari tribe, inhabitants of the North Cachar Hills District of Assam. The basket is woven from bamboo splits of a species of bamboo locally called *waiyung*. The rim-strengthening and bindings are made from a species of cane called *raiwai*. The basket has a square base and a circular rim. In profile, a convex curve near the base straightens out near the rim (figs. 355, 356).

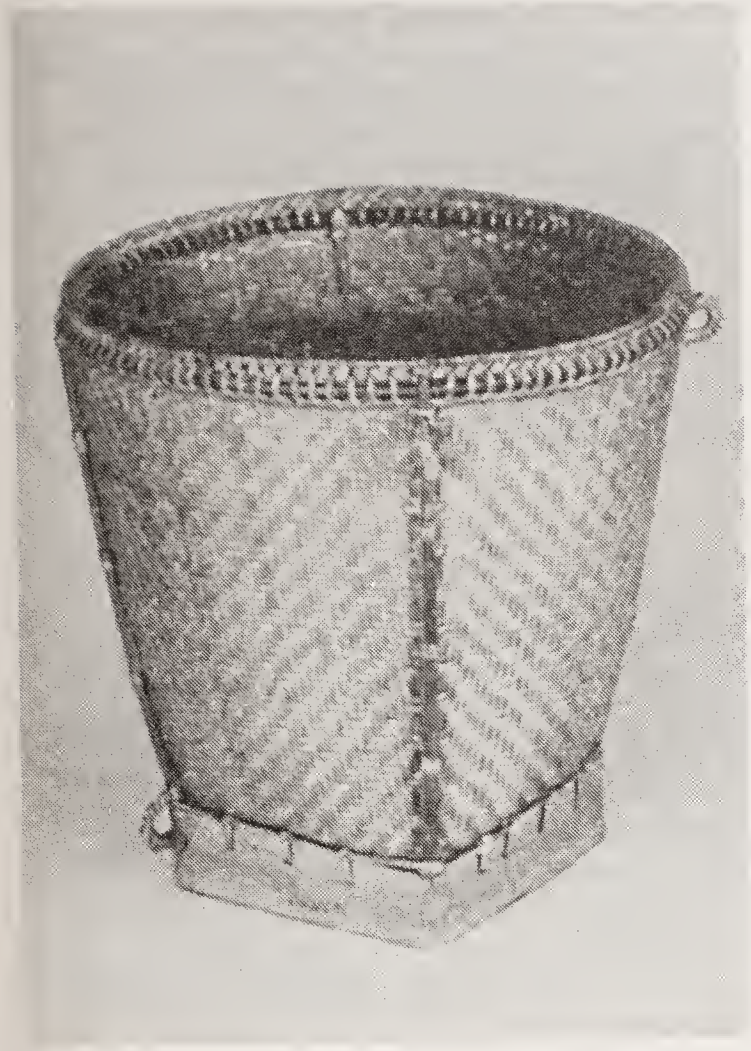
Size and Structure

The diagonal of the base square measures 230 mm, the diameter of the rim is 310 mm and the basket is 340 mm in height. The perimeter of the base square is strengthened by a wide band made from wood and bound to the basket by split-cane binding. This wooden band substitutes for the legs of this basket. The base and sides are woven in the herringbone-twill pattern which radiates from the centre of the base and up each side of the basket. On the sides, the weft is a continuous spiral moving upwards and the base is formed by interlacing mutually perpendicular warp elements. Additional warp elements are introduced in the sides near the side-strengthening elements.

Rim Binding

The rim, which appears highly decorative, has in fact a double rim structure.

The warp elements extending above the last weft element are grouped in pairs before being bent inwards, all inclined in the same direction. These are held by a split-cane binding which passes over a thin ring of split cane through a couple of turns before passing over the inclined end of the warp



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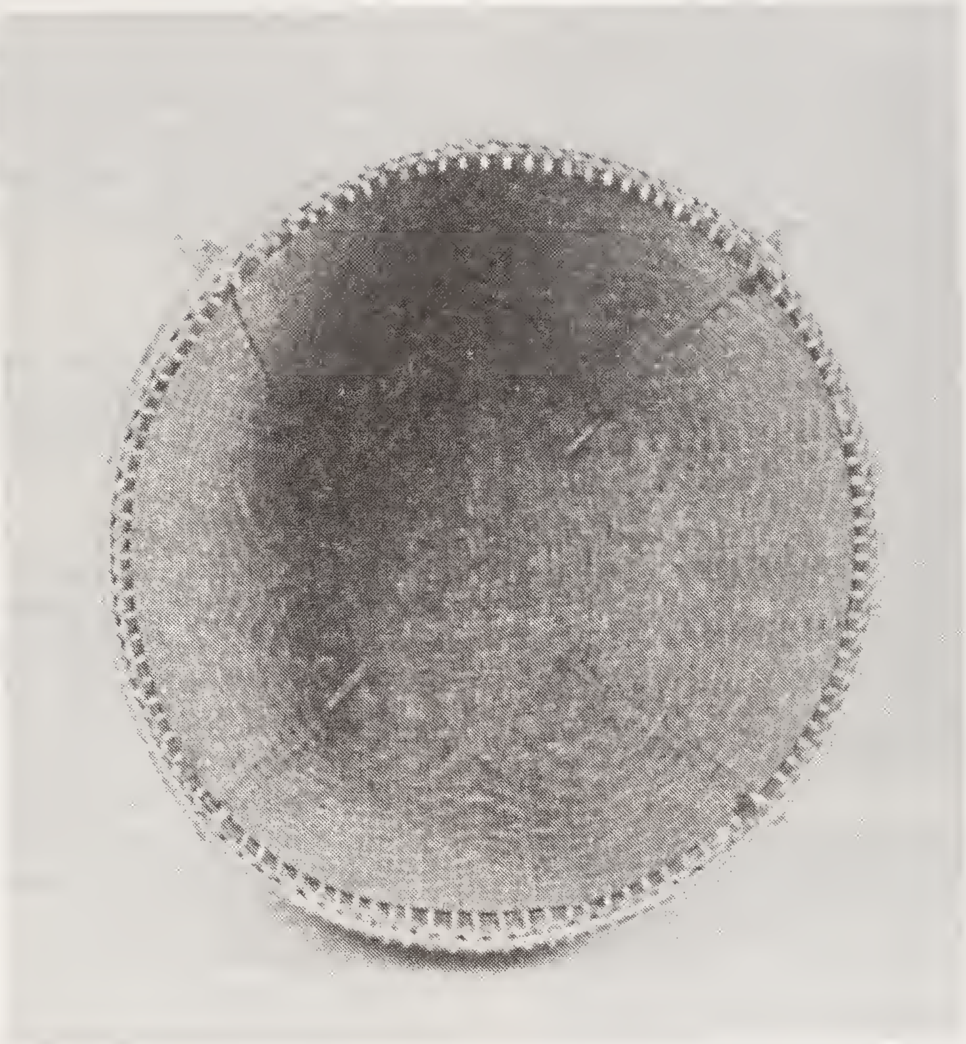

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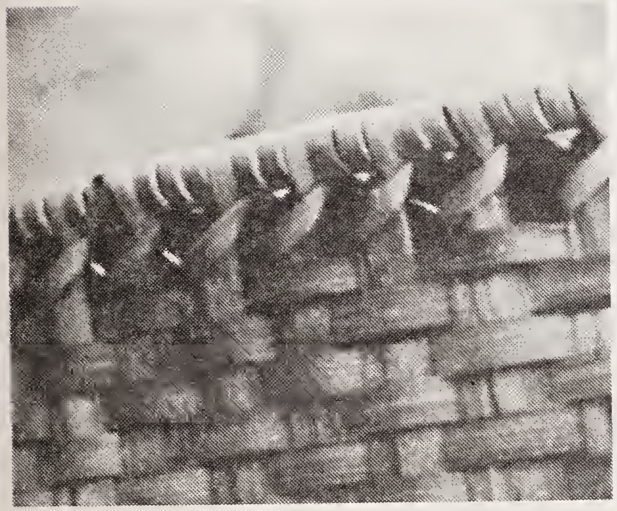

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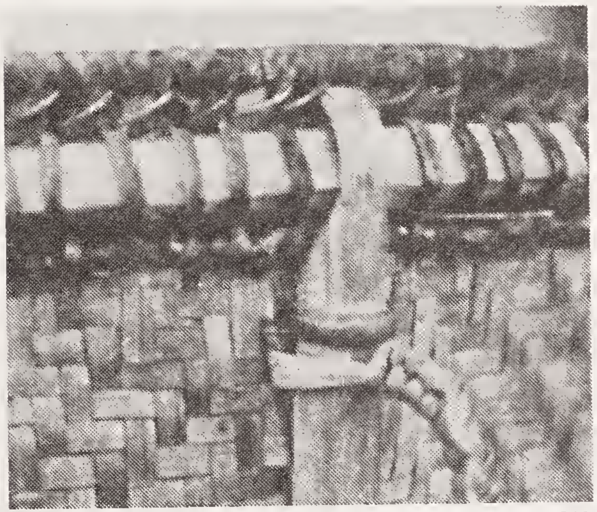

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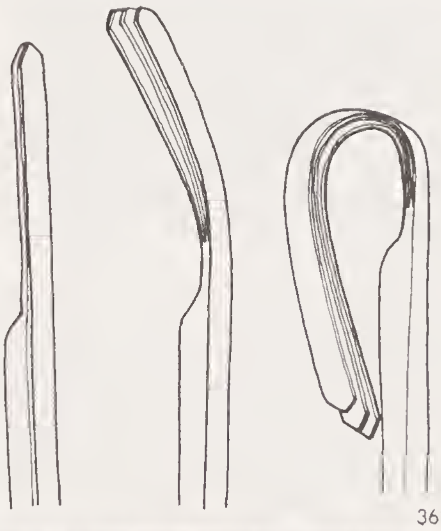

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and holding it firmly against an adjacent warp element. This construction is continued all around the rim (figs. 357, 358). Just below this structure the rim is further strengthened by a pair of rings made from half-cane splits. These rings lie on either side of the side weave and are firmly tied down by split-cane binding. The cross-section of the outer ring is triangular while the inner ring has a semi-circular cross-section (figs. 359, 360).

Side and Base Strengthening

The sides of the basket are strengthened by thick bamboo splits bound by split-cane binding located vertically at the corners of the base square (fig. 361). Each thick split on the outer surface has a corresponding thin split on the inner surface. The inner element penetrates through the base weave at the corners and is stitched through selected weft elements. These are then bent at a point below the base to be bound to the diagonal elements used to strengthen the base weave. The manner in which the outer side-strengthening elements are bound at the rim is significant. The top end of this element is thinned down from the inside surface of the split. Subsequently the remaining thickness of the split is further split into several layers along its thickness to make this part of the split pliable (fig. 362). This end is now bent over the

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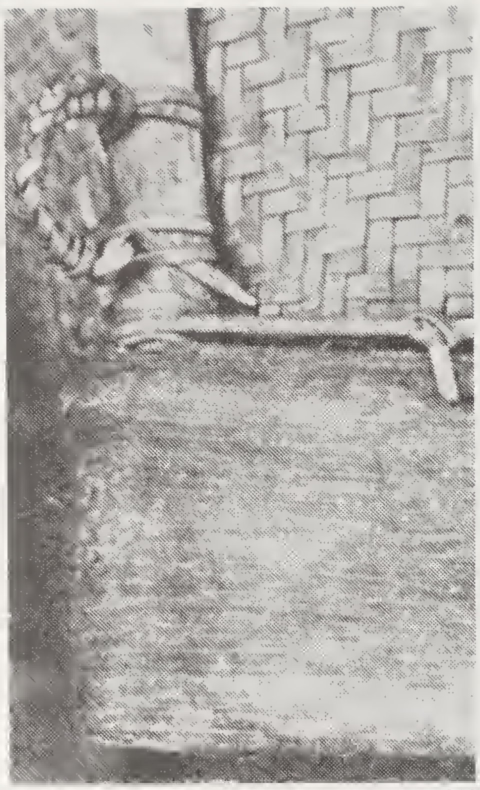

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363: The wide wooden band at the base is stitched onto the basket with split cane.

364: The *khora*, an Angami Naga basket.

365: Riang baskets for men and women.

366: The Riang basket before the rim is finished.

367: The side weave towards the rim of the basket.

368: The two side-strengthening elements are bound together with cane.

369: The movement of the cane split in this binding.

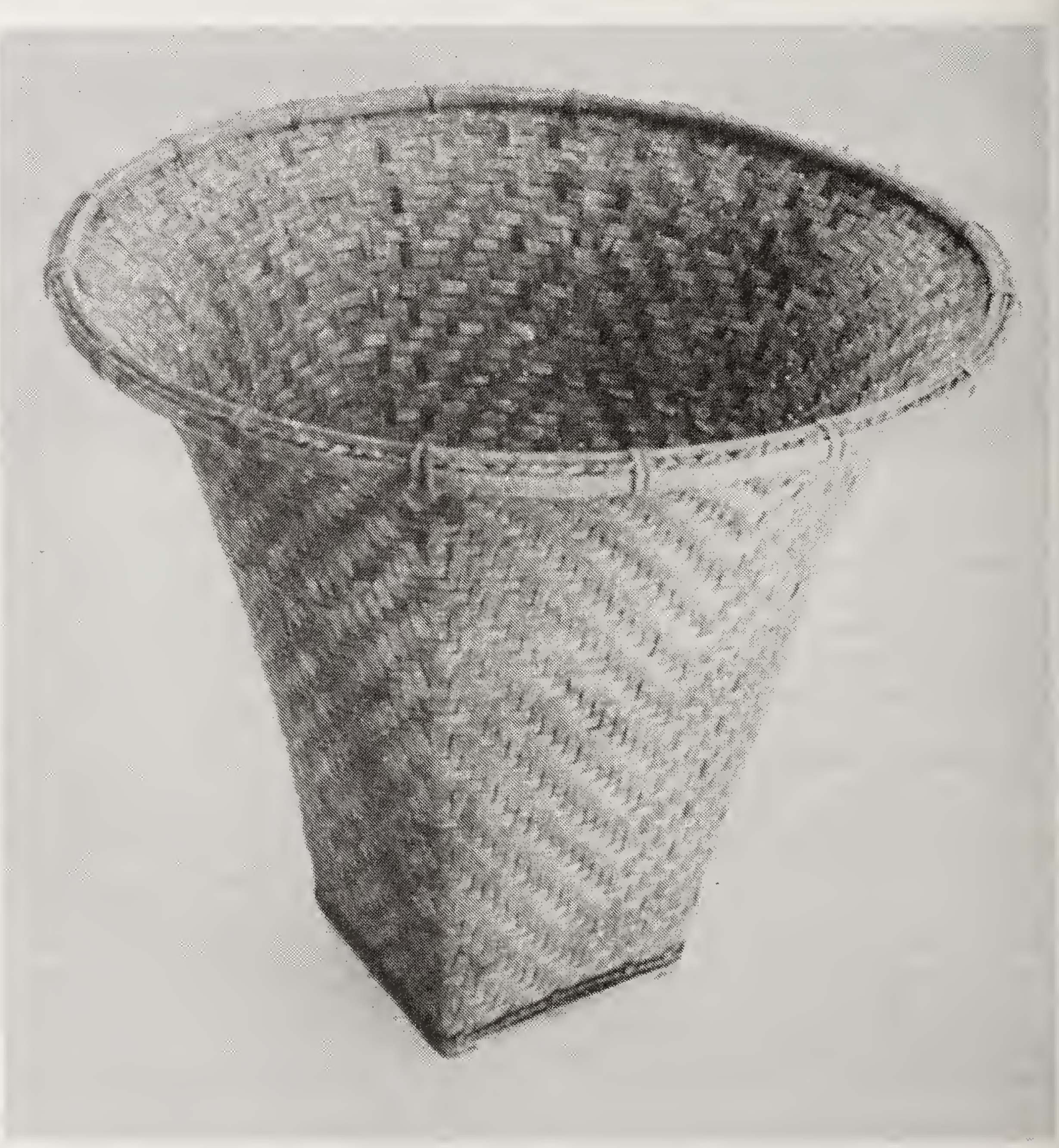
rim-strengthening rings to return vertically downwards on the inner surface of the basket. It is bound tightly to the thick outer split by split-cane bindings passing through the side weave. The loops made to receive the head-strap are also braided in a decorative manner. A wide wooden band is fixed around the perimeter of the base square, creating a stand for the basket. This is stitched to the basket with split-cane binding (fig. 363).

Khora

The *khora* is a closed-weave carrying basket used by the Angami Nagas to transport grain and other field produce. It is woven from split bamboo, both warp and weft elements being fairly coarse.

Size and Structure

The basket has a square base of diagonal 220 mm and the sides flare outward sharply to a circular rim of diameter 490 mm. The height of the basket is 450 mm (fig. 364). The base and sides are woven in the herringbone-twill pattern, starting in the centre of the base and radiating up each side. The rim is strengthened by two strong rings made of wide bamboo splits, which sandwich the edge of the side weave. Before the rings are bound by split-cane binding, the warp elements extending above the edge are twisted around adjacent warp elements forming a rope-like structure. The perimeter of the base is strengthened by a wooden frame made with half-lapped joints at the corners. This frame is attached to the base by metal nails driven into the weave at the corners and bent over the diagonal-strengthening elements on the inside. The use of metal nails seems to have been introduced in recent times.



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Riang Carrying Basket

This is a closed-weave basket used by the Riang tribe of Tripura to carry grains and for general-purpose marketing (fig. 365). This basket is used both by men and women, though the sizes may vary in each case, the female basket being smaller. It is made from bamboo splits while a small quantity of split cane is used in the binding details.

Size and Shape

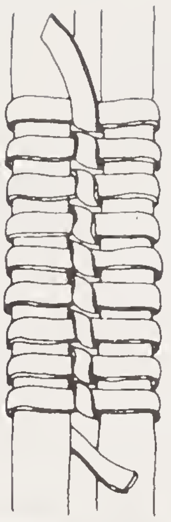
The basket has a square base of diagonal 340 mm and the sides flare out near the rim. The rim diameter is 480 mm and the basket is 470 mm in height.

Base and Side Weave

The base of the basket is woven in a twill pattern defining the diagonals of the square, and the sides are woven in a simple, one directional, two-up-two-down twill with the horizontal weft moving in an upward spiral around the basket. The width of both warp and weft elements are uniformaly coarse at the base and at a part of the side adjacent to the base. The width of the warp is kept constant till the rim. The weft element is progressively reduced in width, forming gradually varying textured bands around the basket. Near the rim the weft elements are about one-sixth the width of the warp elements (figs. 366, 367).

Side Strengthening

The sides of the basket are strengthened by pairs of bamboo splits located vertically at the corners of the base square. The top end of these splits are shaped like a flat needle, to enable them to be introduced into the side weave, stitching through a sequence of weft elements. The two strengthening elements at each corner lie side by side stitching into an alternate sequence of weft elements.



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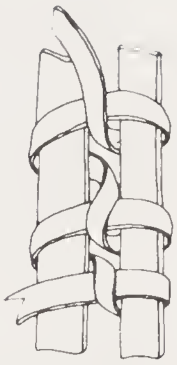

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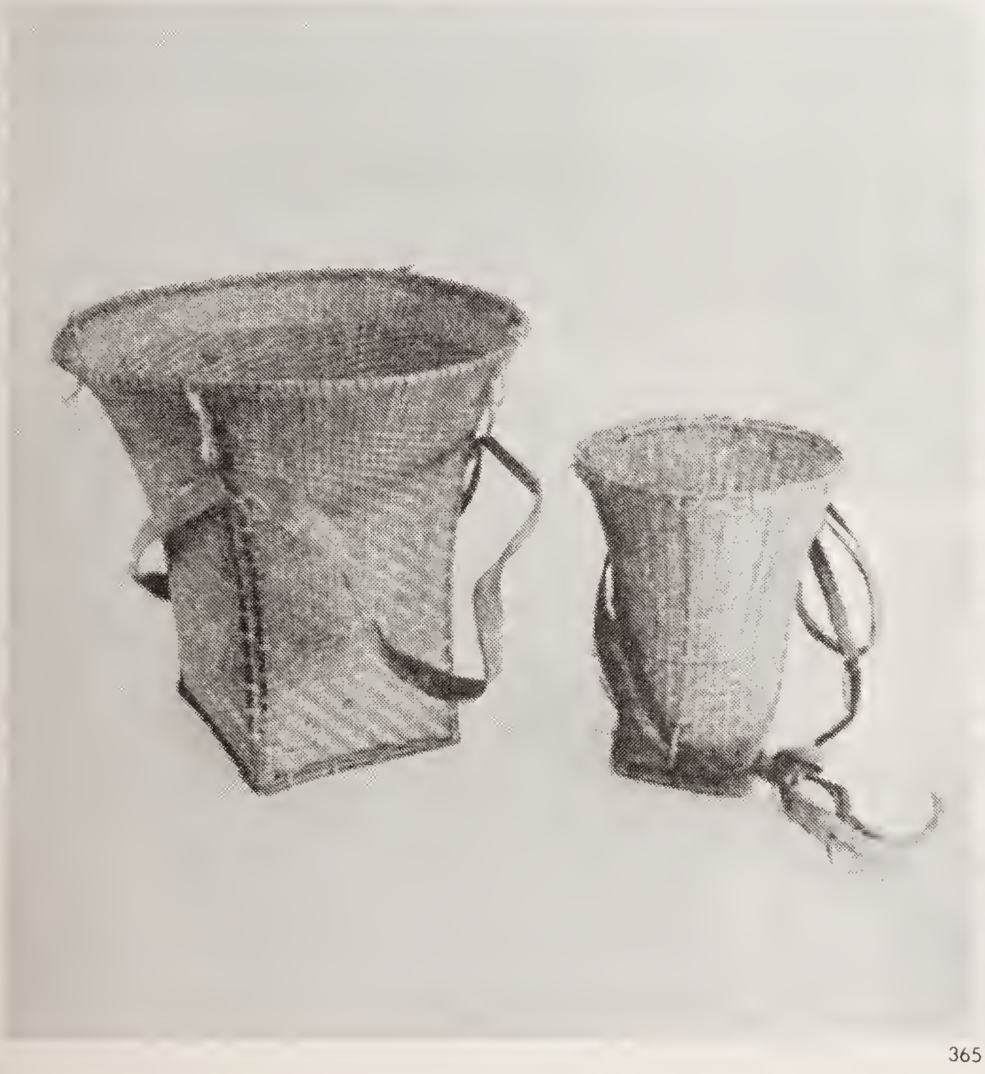

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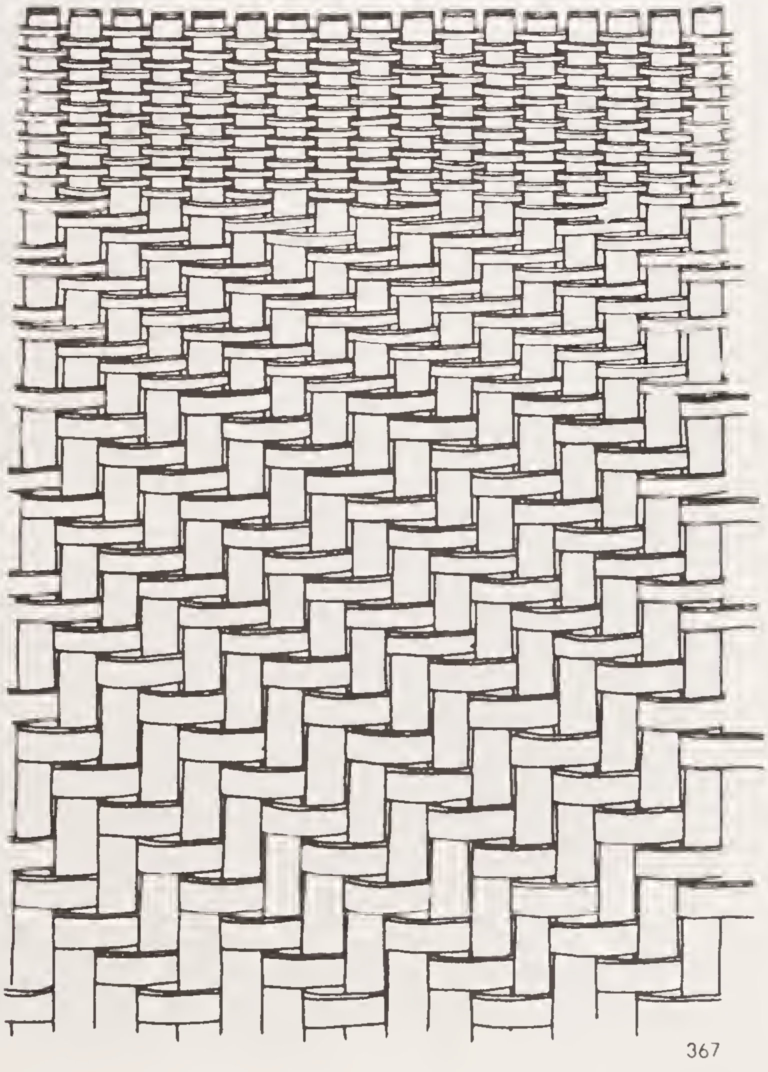

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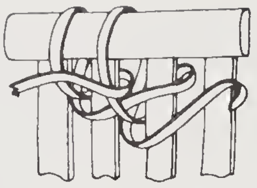
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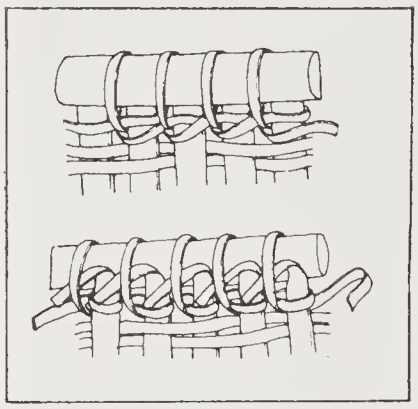
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Surface Finish

These side-strengthening elements are coloured dark brown with the use of a vegetable dye (*leguminaceae*). The two splits are bound together in an interesting cane binding before being bent, each to move over one edge of the base square (figs. 368, 369). The perimeter of the base square is further strengthened by a half-cane split, bound to the base weave along with the lower bent part of the side-strengthening elements.

Rim

The rim uses a single ring of split bamboo on the outer surface of the basket. The warp ends are twisted and bent inwards at an angle before a split-cane binding holds these ends firmly against the bamboo ring (figs. 370, 371). Loops provided for the head-strap use split-cane.

The smaller basket for women is identical in construction except at the rim. The warp elements extending above are twisted in one direction at least through two turns before they are sandwiched between two stiff rings of split bamboo, joined with split-cane binding.

370: Detail of the rim binding as seen from outside and inside.

371: The movement of the cane strip in the rim binding.

372: The *khang*, a Konyak Naga basket.

373: The *khang* as seen from above.

374: The tabby and zig-zag twill weave used in the side.

375: A cutaway diagram of the side-strengthening element.

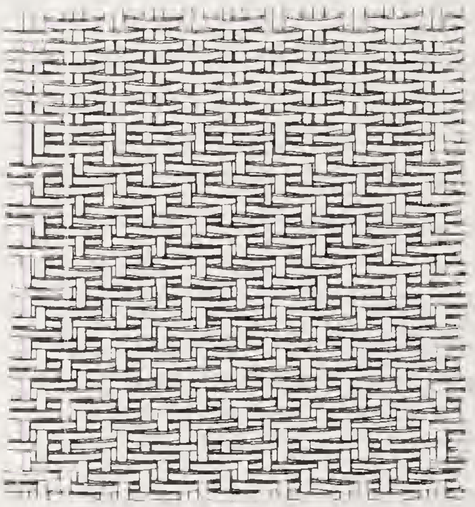
376: Different cane and bamboo products in one Konyak Naga house.

377: A Konyak Naga craftsman.

378: The subtle pattern in the weave can be seen against the light.

379: A decoratively bound rim and side-strengthening element.

380: A decorative termination of a side-strengthening element.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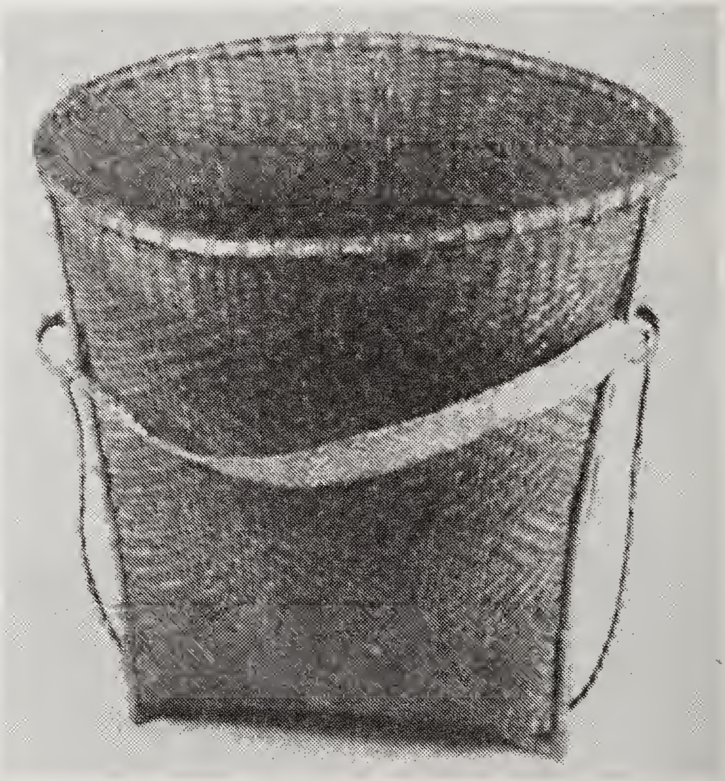
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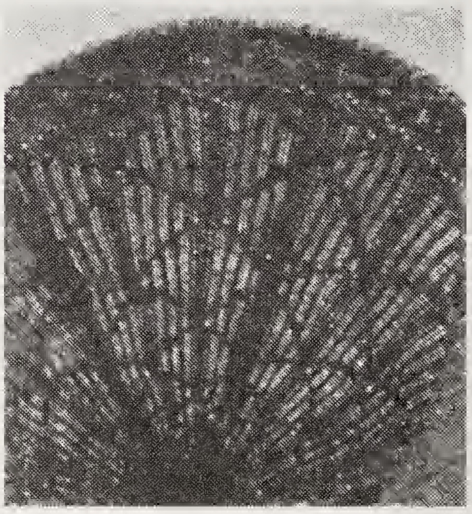
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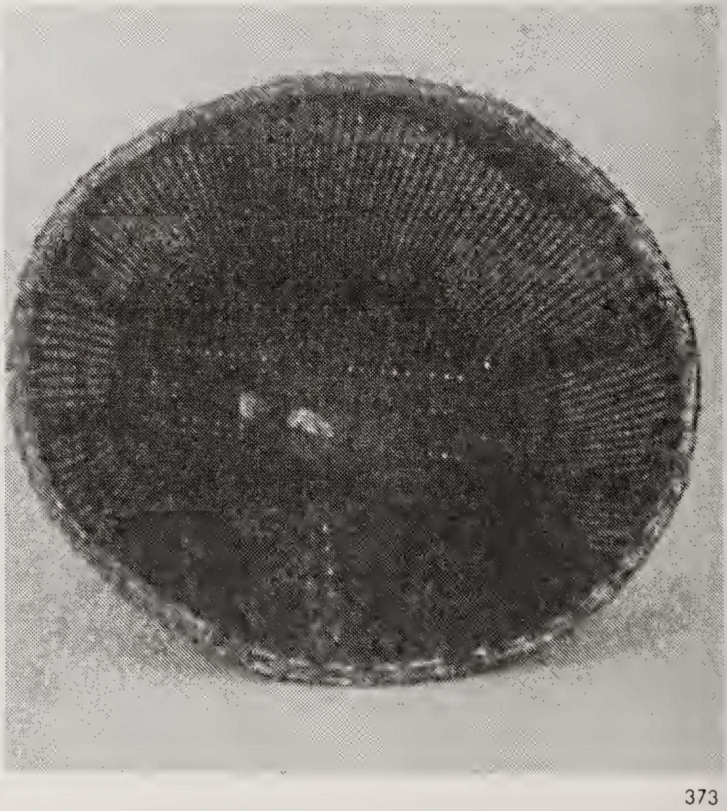
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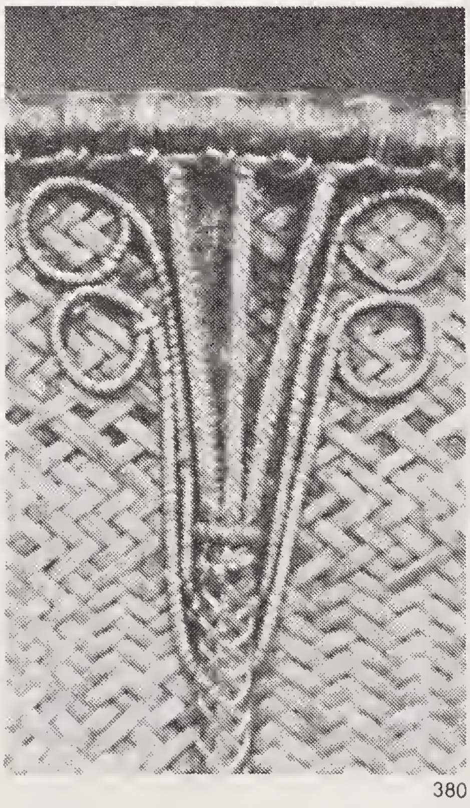
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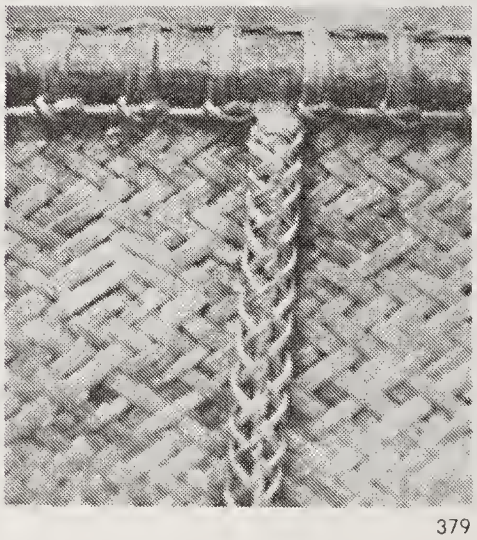
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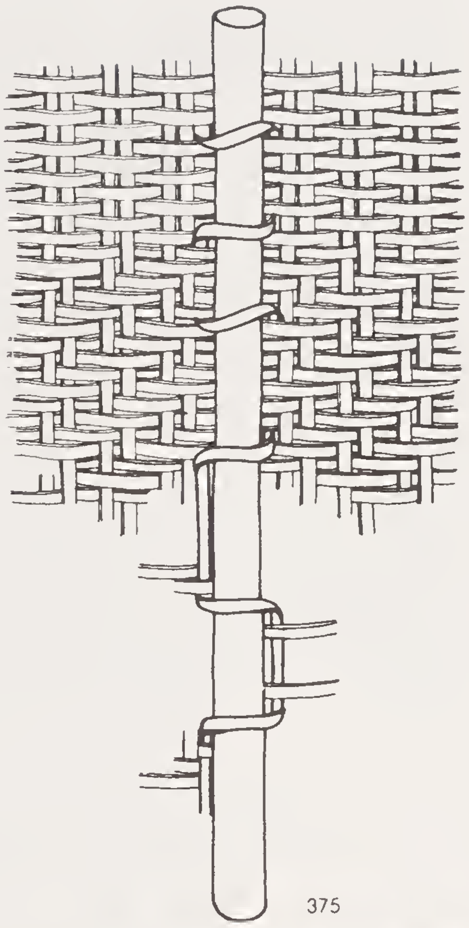
Khang

The *khang* is a closed-weave carrying basket used by the Konyak Nagas of Mon District in Nagaland to carry grain (fig. 372). It has a rectangular base 260 mm by 60 mm, with the sides tapering up to an elliptical rim of major axis 370 mm and minor axis 330 mm. The height of the basket is 400 mm (fig. 373).

Weave Structure and Other Details

The basket is woven from split bamboo, the base in twill weave, where two sets of warp elements are taken in pairs. The sides of the basket are woven in a combination of tabby and twill weaves. The upper part of the sides is woven in tabby while the remaining portion is in a zig-zag twill pattern (fig. 374). No additional warp elements are introduced in the side weave, but the gaps between consecutive warp elements increases gradually towards the rim. Consequently, the weft floats are longer near the rim than near the base. The rim is strengthened by two half splits of cane, bound on both sides of the edge. The sides are strengthened by stiff bamboo splints (fig. 375) and the branch portion, which is left attached to this splint, strengthens the base weave by forming the diagonals. This element is bound to the side and base weave by split-cane binding.



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Other Konyak Baskets

Another closed-weave basket made by the diagonal weaving method is used by the Konyak Nagas. This basket is tall and conical with a very small base. It is used primarily to transport grain and is carried with a head-strap. It is similar in structure and form to the baskets used by the Wancho and Nocte tribes living in neighbouring Arunachal (figs. 376, 377). Some of these are unselfconsciously decorated by subtle patterns built into their weaves and binding details (figs. 378-380).

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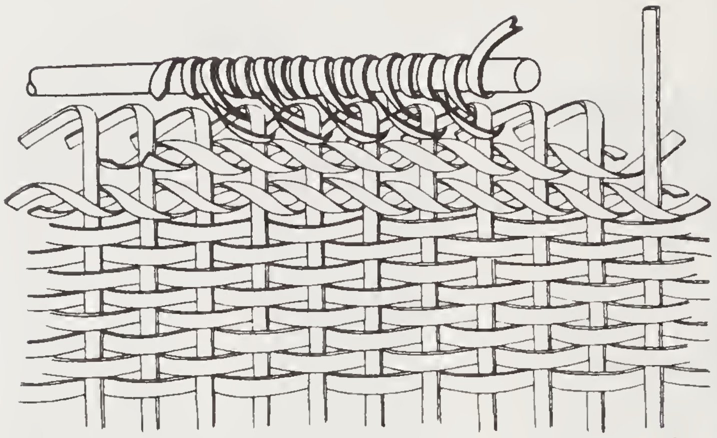
381: The *walak*, a Nocte basket.

382: A simple tabby weave used in the side.

383: A cutaway view of the side-strengthening element.

384: Detail of the rim binding.



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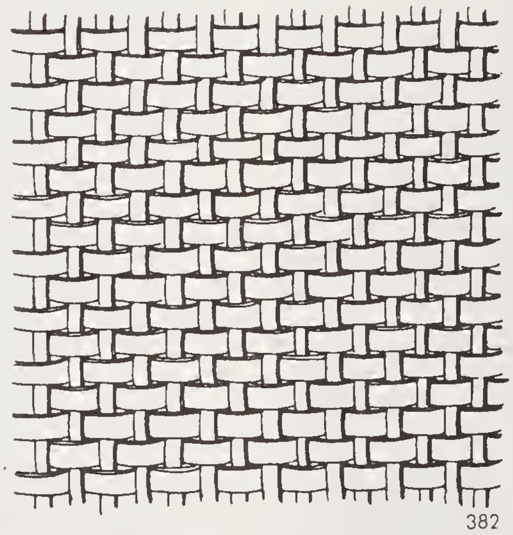

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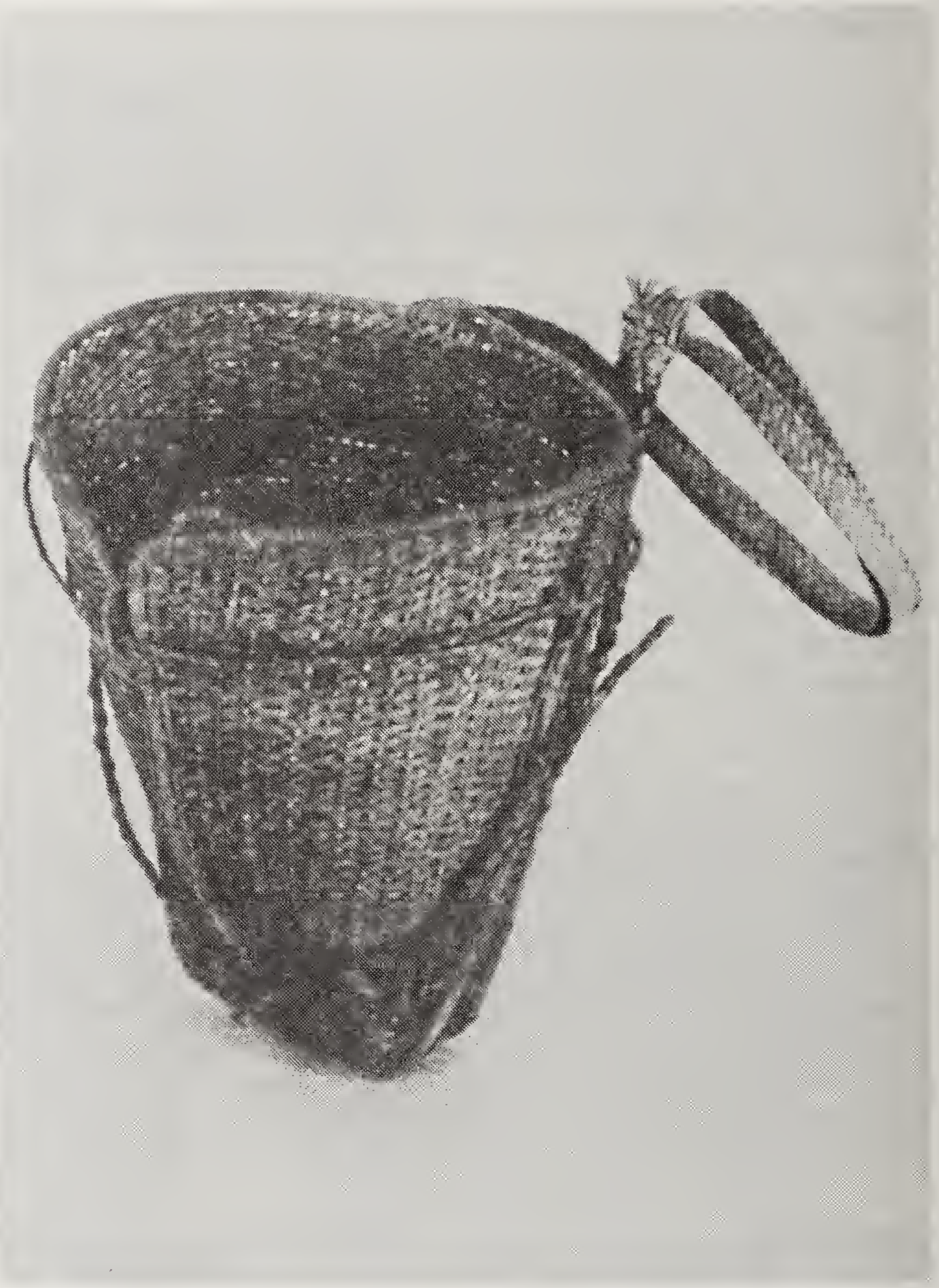

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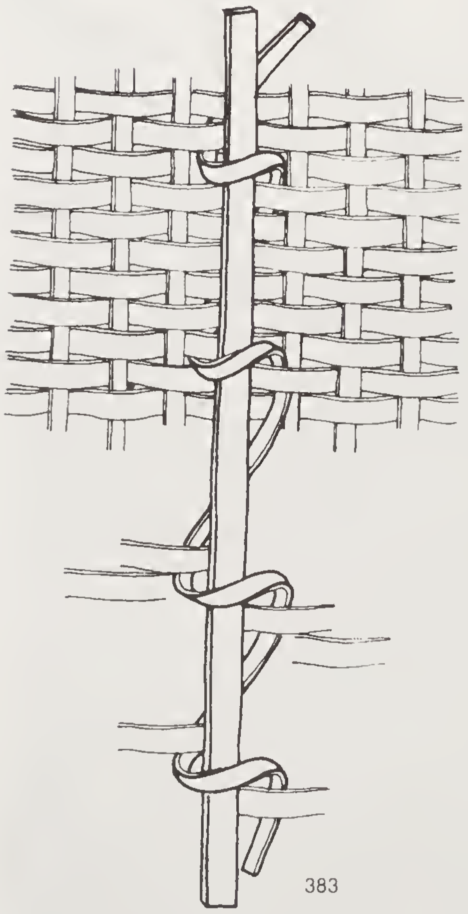

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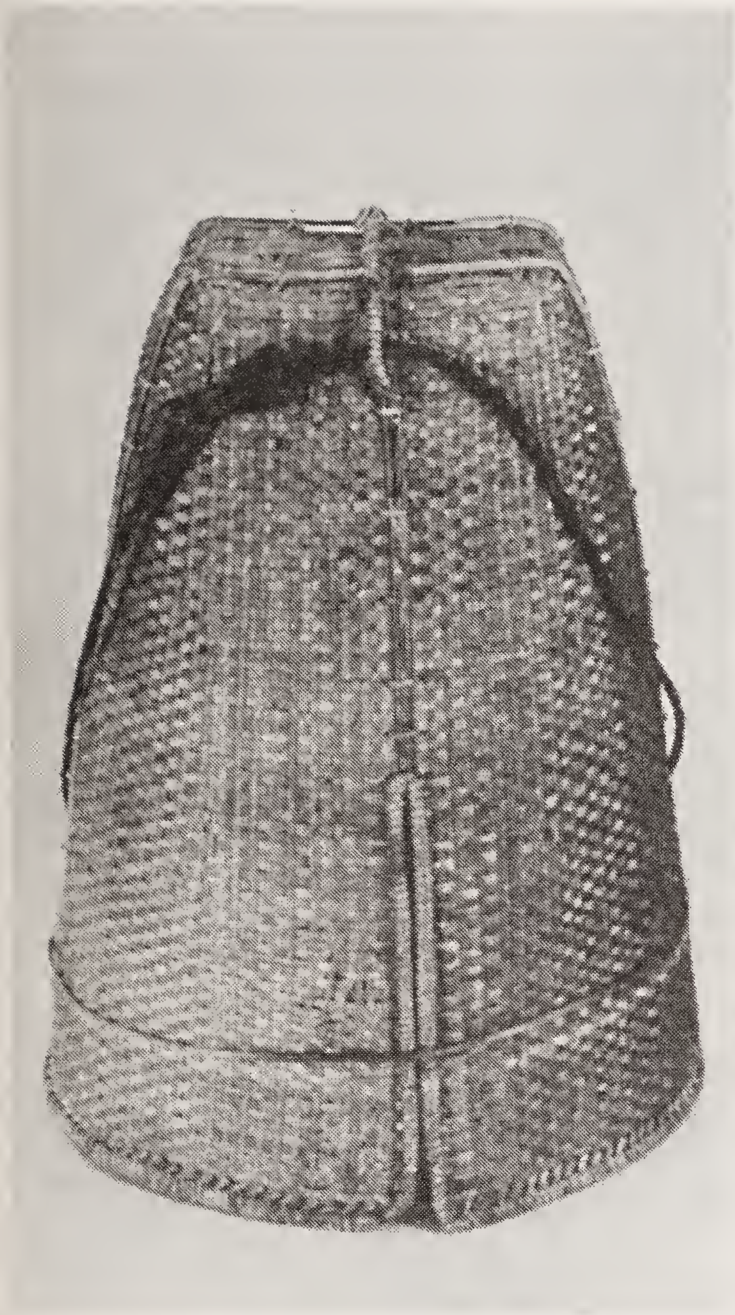
Walak and *Thongpin*

The *walak* and *thongpin* are two similar closed-weave carrying baskets, used by the Noctes and Wanchos of Tirap District of Arunachal to carry meat and fish (fig. 381). These are used only by men. Both baskets have a rectangular base leading to an elliptical rim. The back of the baskets, i.e., the side that is away from the body, is split down half the height from the rim downwards, so that the loose flaps created can be made to overlap by tightening the rope provided, effectively reducing the size of the open rim. The *walak* is made entirely from split cane.

Size and Structure of *Walak*

Its base measures 140 mm by 60 mm and the elliptical rim in the normal position has a major axis of 300 mm and a minor axis of 240 mm. The height of this basket is 380 mm. The warp elements of the sides interweave in a simple basket weave to form the base. These are then bent up to be interlaced by a horizontal weft element moving in a continuous spiral and weaving through the warp in a tabby structure (fig. 382). The spiralling weft continues till the bottom of the slit, after which the weft elements move in one direction upto the edge of the slit and turn around the edge, to return across the face of the weave. Tabby structure is maintained in this part and the edge created is similar to the selvedge of woven fabric, with the weft turning around the last warp element. At three points on the side, the interlacing structure of the weft is modified. The first is located just below the level where the slit in the side begins, the second just below the rim structure and the third in between the first two. Here a pair of weft elements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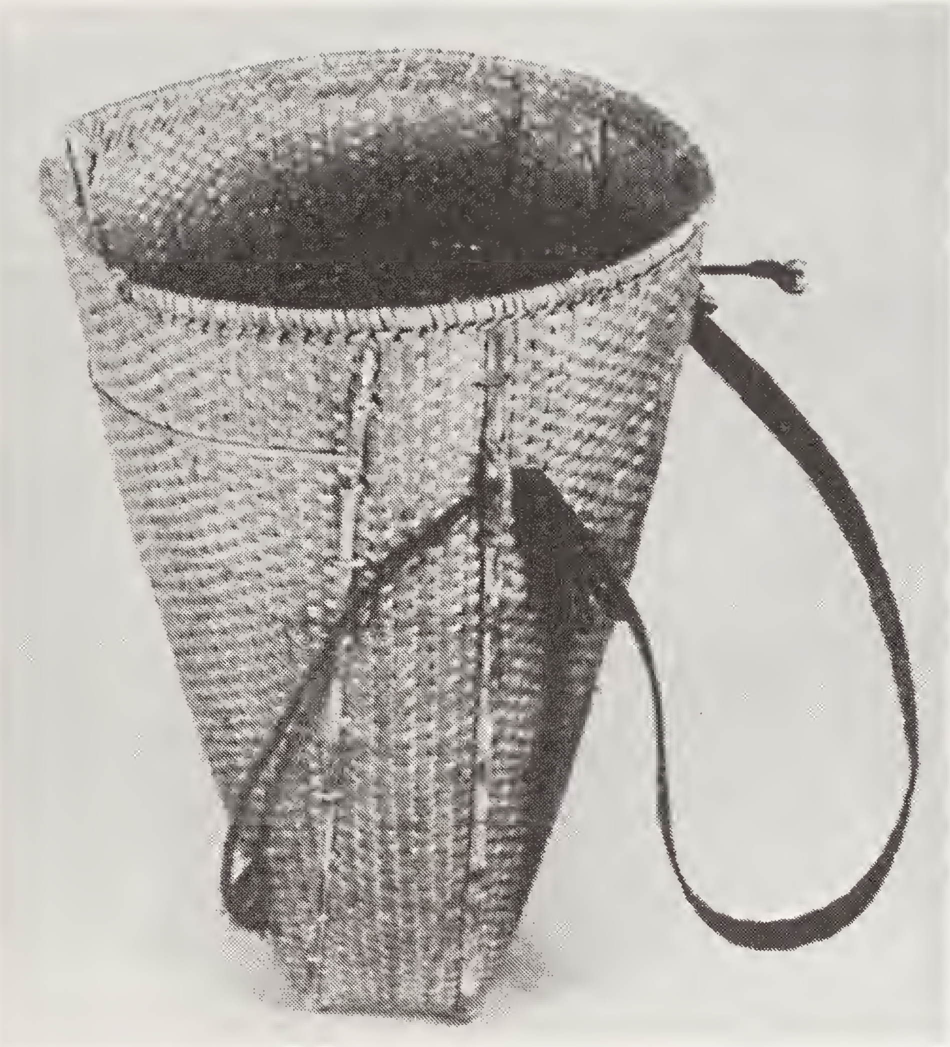

385

385: The *thongpin*, a Wancho basket.

386: The *thongpin* resting on its rim.

twist around one another, rope-like, locking a warp element between each turn of the twisting pair of wefts.

Rim and Other Details

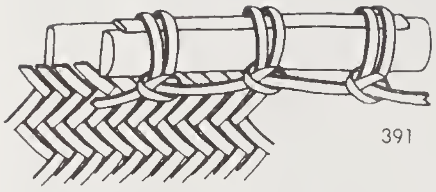
The base and sides of the basket are strengthened by two lengths of half-cane splits. Each one runs parallel to the longer edges of the rectangular base and then bend at the corners to pass vertically up to the rim. These are bound to the weave structure by split-cane bindings (fig. 383). The ends of the warp extending above the last weft element are bent inwards, all inclined in one direction, before being bound by a split-cane binding. This binding element coils around a stiff cane split located above the edge, before passing through the woven edge, to hold the inclined ends firmly against adjacent warp elements (fig. 384). Both the coiled binding and the stiff core pass along the slit edges down the side, locking into the side weave intermittently. The *walak* is provided with a shoulder strap so that it can be carried on the back like a haversack.

Size and Structure of *Thongpin*

The *thongpin* is slightly larger than the *walak* and it is made from split bamboo, while split cane is used only in the strengthening elements and in binding (figs. 385, 386). The *thongpin* does not use the twisted weft structure at any point, but it has a uniform tabby structure in the side weave. It is provided with a braided head-strap attached in an interesting manner to the circular plaited rope. The rectangular base of the *thongpin* measures 150 mm by 70 mm and the elliptical rim has a major axis of 310 mm and minor axis of 260 mm. The height of the basket is 400 mm.

Din

The *din* is woven from fine bamboo splits. The diagonal weaving method is used in constructing this basket (fig. 387). At the base, two sets of elements interweave in a two-up-two-down twill, each set parallel to the diagonal of the rectangular base. The ends extending beyond the base are bent up to form the sides and these two sets continue to interweave, each moving up the sides diagonally, inclined in the opposite direction. The twill weave pattern is varied selectively to create textured bands, vertical bands on the lower half changing to horizontal bands up to the rim (figs. 388, 389).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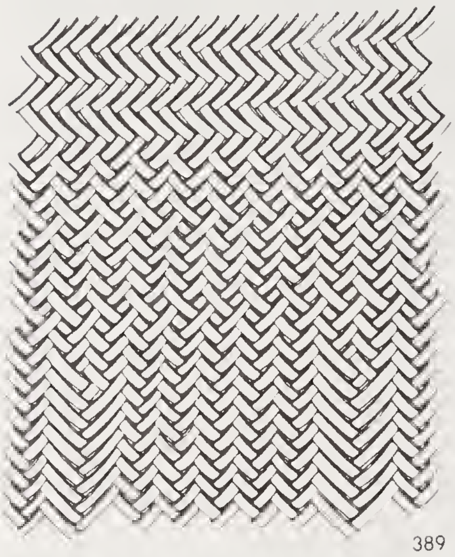
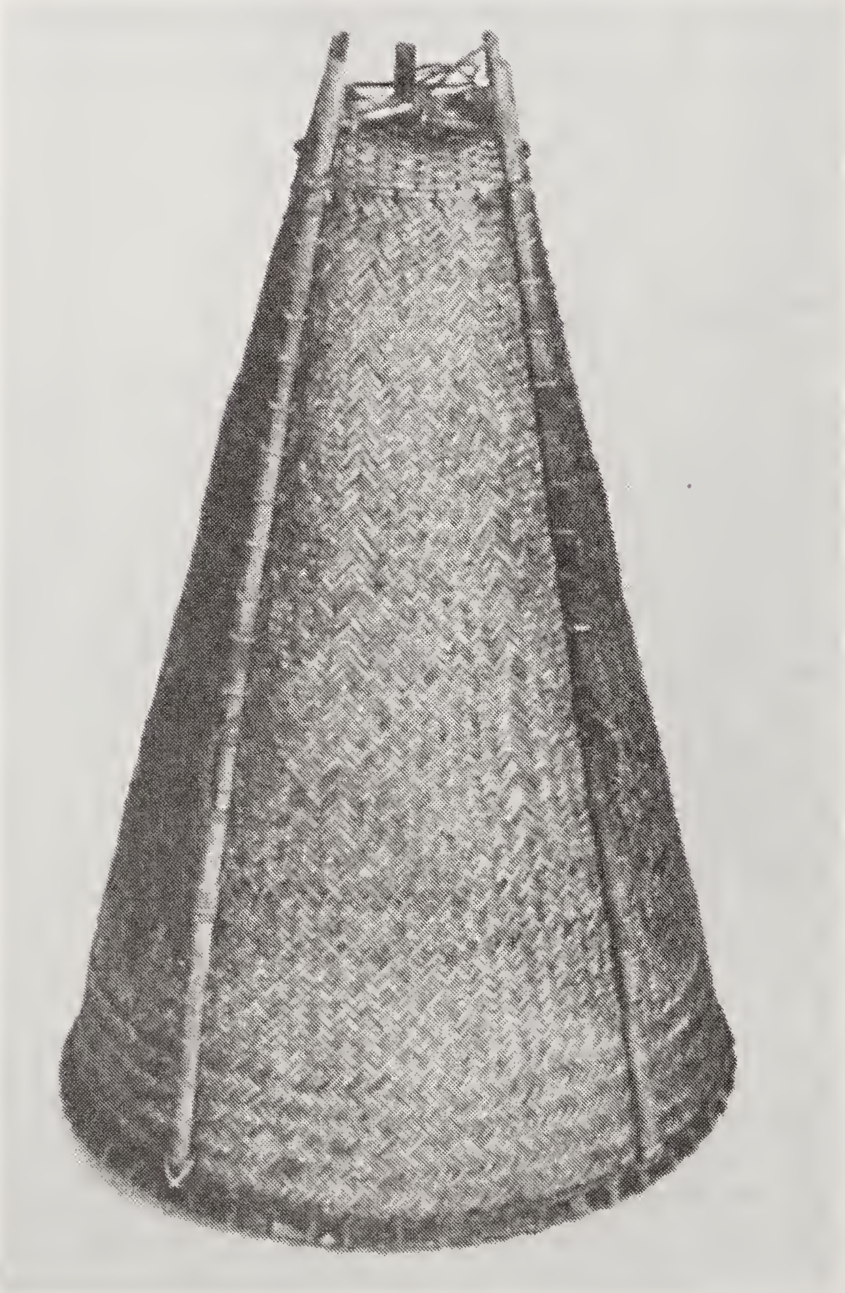

389

Base Strengthening

The base, together with a small portion of the sides adjacent to it, are strengthened in an interesting manner by a superimposed woven layer made from split cane (fig. 390). This layer is constructed in a manner similar to the way in which one would darn a hole in a fabric. A single length of split cane is stitched into the side weave to move back and forth across the base, forming rows of parallel lines, each end stitched into the side weave before being taken across the base to the other side. When the required number of lines are completed in one direction, spaced across the base, the cane split is placed in the direction perpendicular to the previous set, weaving in and out of that set to stitch into the side weave before returning. A second length of split cane is passed around the perimeter of the rectangular base, moving upwards in a spiral and weaving into the previous strengthening set upto the point where that set is stitched into the side weave.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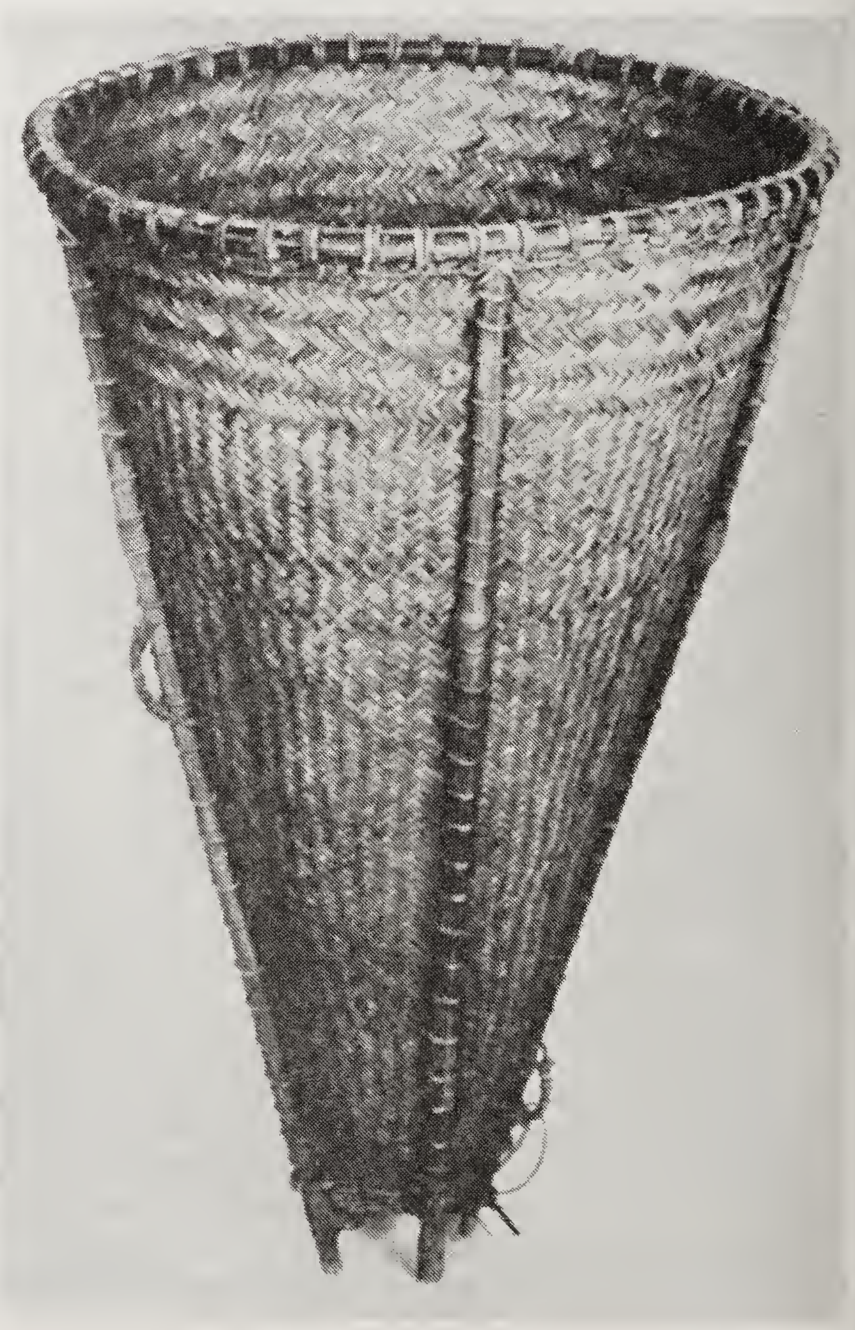
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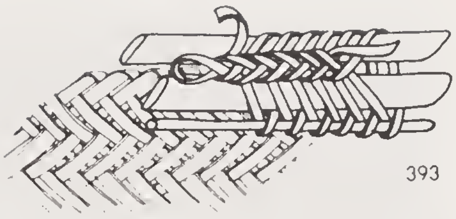
Rim and Side Strengthening

The sides of the basket are strengthened by thick splits of bamboo joined to the side weave by split-cane binding. The branch extending from this split is used to strengthen the base. The rim is strengthened by sandwiching the upper edge between two rings made from half-cane splits which are bound together by split-cane binding (fig. 391).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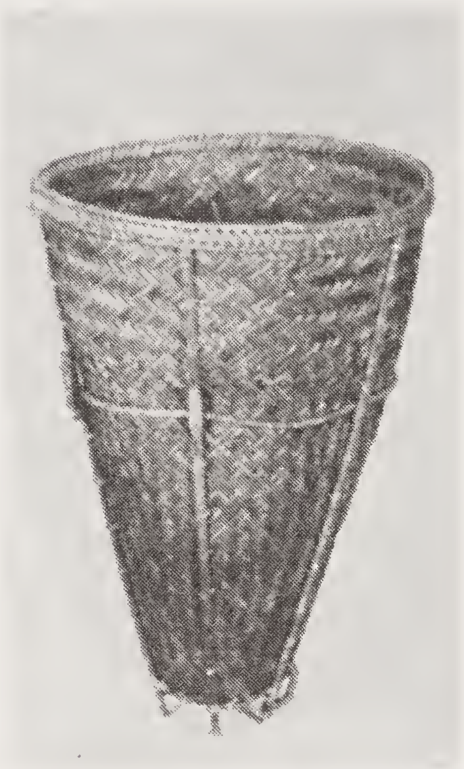
Borit

The *borit,* which is similar to the *din* though much smaller, is used by Nocte girls to carry their personal belongings to the fields. The basket is made of split bamboo and woven by the diagonal-weaving method, identical to that of the *din* (fig. 392). However, the base-strengthening does not use the second layer. It is carried by a single strap hung over the shoulder. The *borit* has a rectangular base 60 mm by 50 mm and an almost circular rim 230 mm in diameter. The height of the basket is 340 mm.

Side and Base Strengthening

The sides of the basket are strengthened by stiff bamboo splits running vertically down the sides and located at the corners of the base rectangle. These extend below the base to form the legs. The vertical elements are notched to receive cane bindings, which pass diagonally across the base to tie these verticals. The perimeter of the rectangular base is strengthened by a split-cane braiding locked into the weave structure.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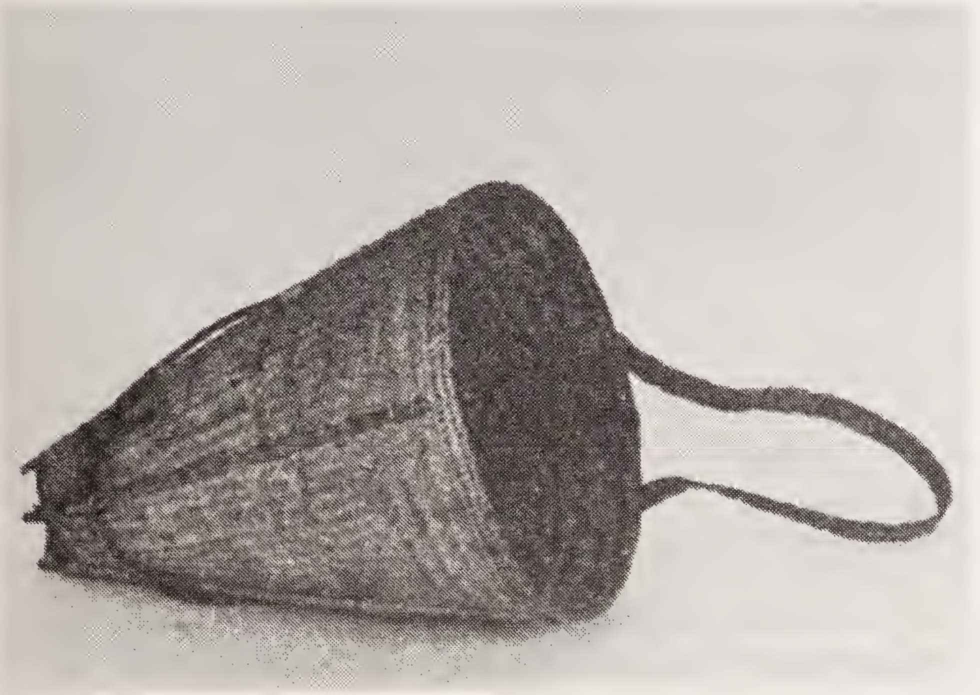
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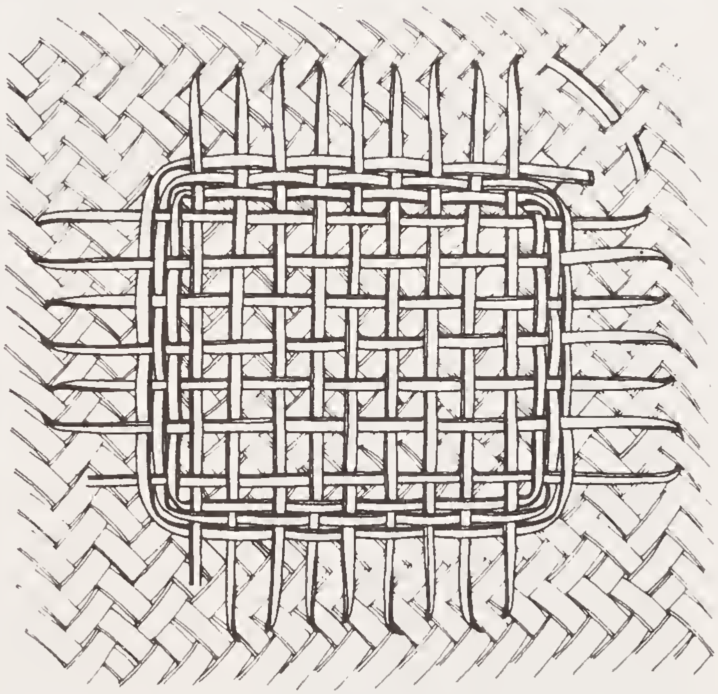
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Rim

The rim is strengthened with a rather decorative binding (fig. 393). The open ends of the side weave at the rim are first folded back before the edge is sandwiched between two wide rings made from split bamboo, which are bound together through the side weave by fine split-cane binding. The cane binding is wrapped around a third ring, on the outer surface below the sandwiching rings, before passing through the side weave. At the top edge of this rim the cane binding forms a braided band.

Dinkhi

The *dinkhi* is a closed-weave carrying basket used by young Nocte girls (fig. 394). It is identical in construction to the *borit* though smaller in size. It has a small rectangular base 55 mm by 45 mm, a circular rim of diameter 165 mm and it is 260 mm in height.

387: The *din*, a Nocte basket.

388: The *din* resting on its rim.

389: Vertical and horizontal bands created in a twill weave.

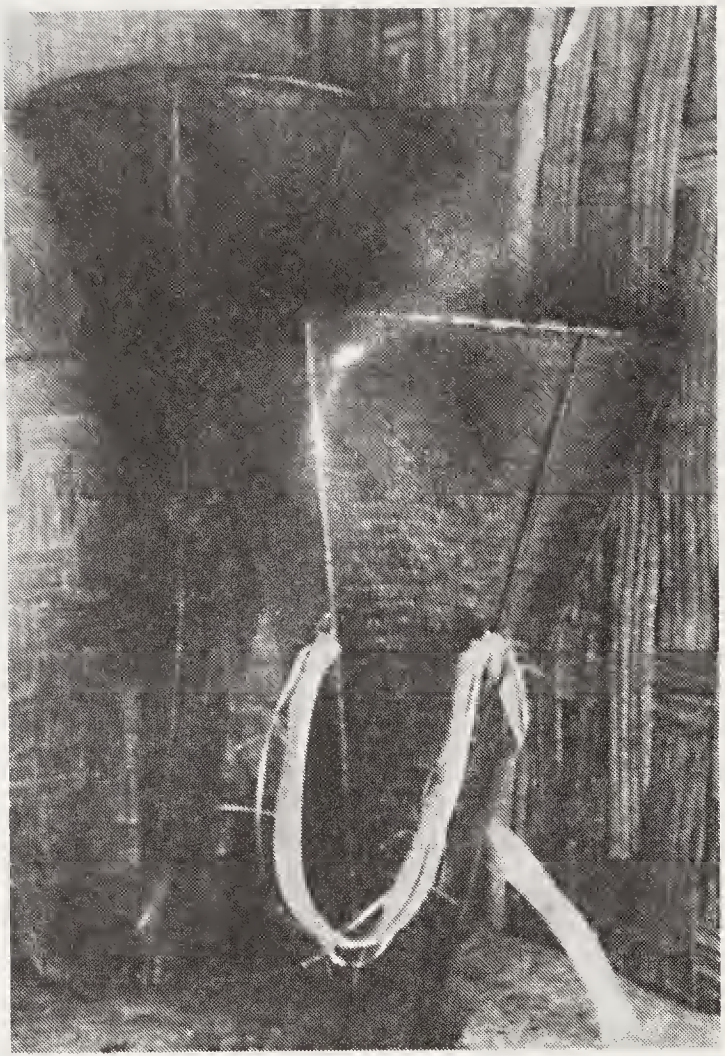
390: The base of the *din* is strengthened by a superimposed woven layer of split cane.

391: Detail of the rim binding.

392: The *borit*, a smaller version of the *din* used by the Nocte girls.

393: Detail of the rim binding of the *borit*.

394: The *dinkhi*, used by young Nocte girls.



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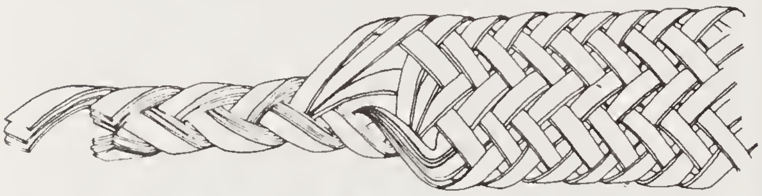

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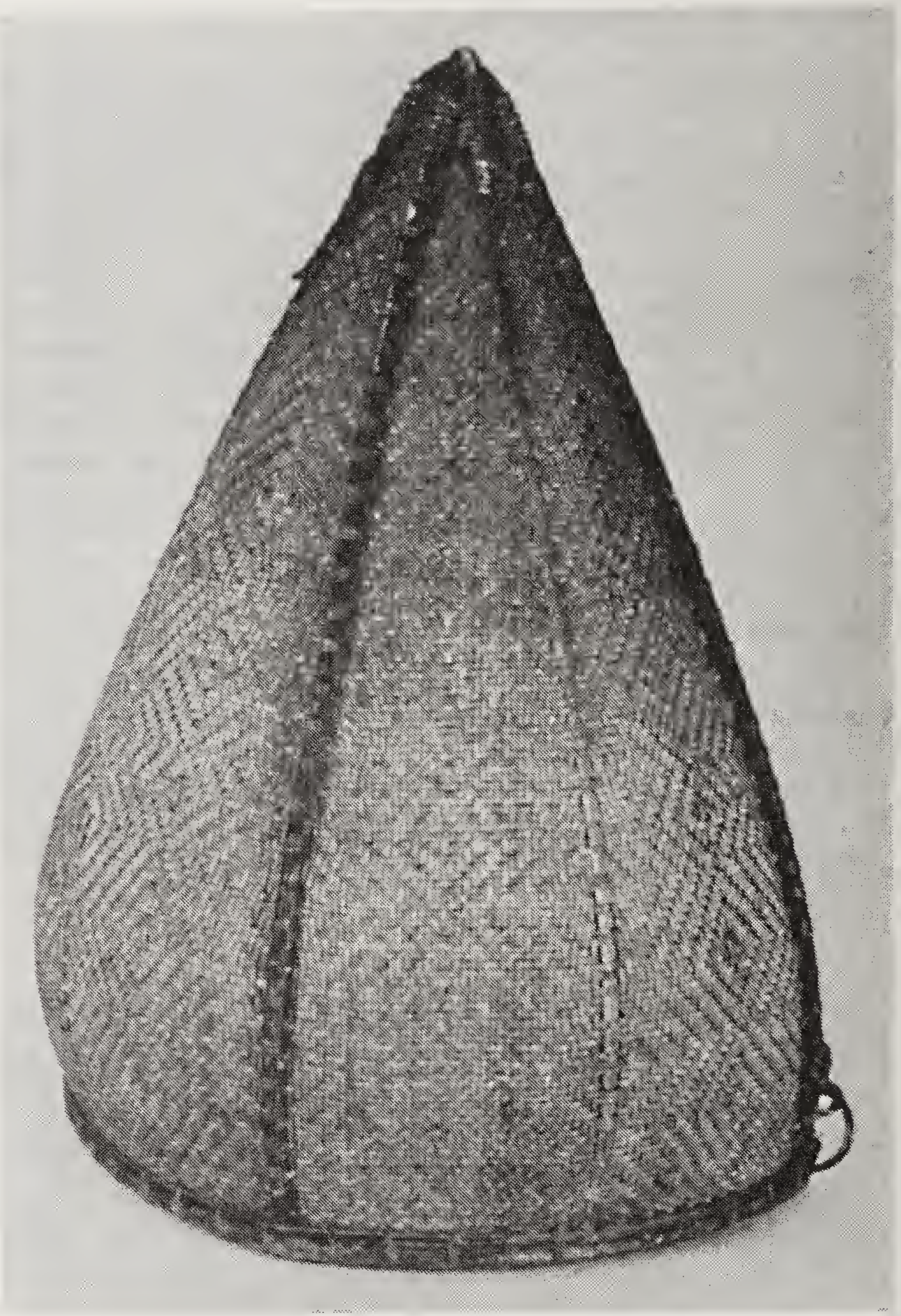

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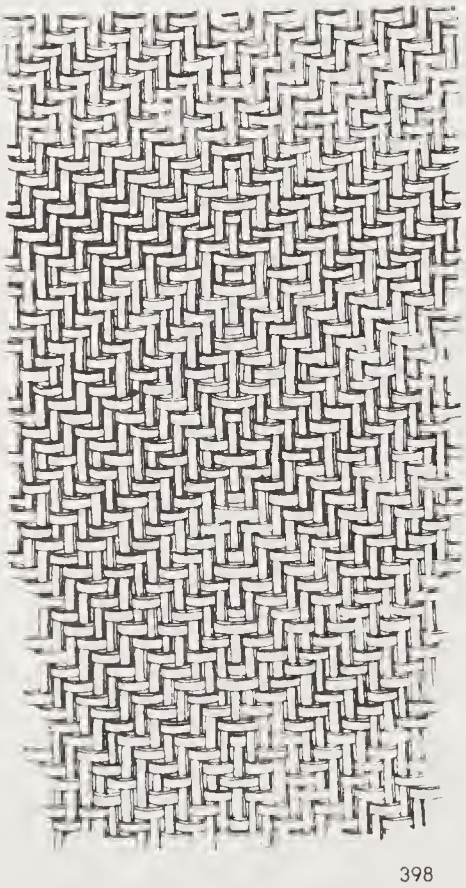


398

Khu

The *khu* is an Ao Naga carrying basket with a closed weave and it is used for carrying paddy (fig. 395). The basket is dramatically tall in relation to its width and it is sharply conical. It is woven using the diagonal-weaving method. From a small square base the sides flare out to a large circular rim more than four times as large. The height of this basket is almost twice the diameter at the rim.

Size and Shape

The piece acquired is a miniature version of the normal Ao Naga *khu.* It has a square base of diagonal 40 mm, a circular rim of diameter 160 mm and a height of 310 mm. The original basket is at least five to six times as large.

Side Weave and Other Details

In the sides, the two sets of elements extending from the base pass diagonally upwards, weaving in an uniform twill pattern, creating visually horizontal bands. The side weave is strengthened vertically by seven or more thick splints of bamboo, arranged around the circumference of the rim on the outer surface. These are bound to the side weave by split-cane binding. The rim is strengthened by sandwiching the upper edge of the side weave between rings made of half-cane splits, after the open ends of the elements used in the side weave are twisted and tucked back into the weave structure.

Nishi Carrying Basket

This basket is used by the Nishi tribe of Arunachal. The Nishis live in Subansari District in villages surrounding the Apa Tani plateau and they have a long history of interaction with the Apa Tanis. In spite of this, their carrying basket is totally different in form and construction from the Apa Tani *barju* (fig. 313) which is used for an almost identical purpose.

Size and Shape

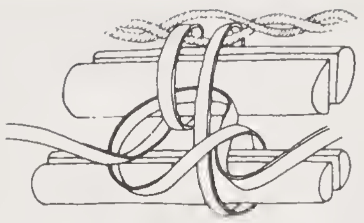
The Nishi basket has a form which is like an inverted tear-drop, with the spherical part of the drop removed to create the rim and the conical part forming the base (fig. 396). Hence, it has a circular rim from which the sides bulge out slightly before tapering sharply to a pointed end. It is carried over the back with the aid of a head-strap made by braiding split cane in an interesting manner (fig. 397). The diameter of the rim is 310 mm and the sides bulge to a maximum diameter of 340 mm about 100 mm below the rim. Its height from base to rim is 440 mm.

Base and Side Weave

The base of the basket is formed by a number of thin warp elements overlapping radially in the centre, each being bent sharply to move up vertically on opposite sides of the basket. The weft is a spiralling element that weaves into the warp in a decorative twill weave (fig. 398). The weft is made from thin splits of bamboo. The side strengthening of the basket is integrated in the weave by introducing extra warp elements made from split cane. These elements are wider and thicker than the main warp elements and each extra-warp consists of two splits lying one over the other. Just like the thin warp elements, these extra-warp elements overlap radially at the base to form eight spokes up the sides of the basket. The weft element, in consecutive turns, weaves over or under or passes between the two layers formed by each pair of splits composing each extra-warp element, integrating these into the side weave structure. Only a few of the thin warp elements pass under the base. Hence additional thin warp elements are introduced, always located on either sides of each extra-warp element. The sides of these baskets are further strengthened by two additional whole cane elements of a small cross section. These are located on the outer surface of the basket. They run parallel to and are superimposed over alternate pairs of extra-warp elements. These outer-strengthening elements are thinned down slightly as they approach the rim of the basket and they are bound to the side weave with split-cane binding.

Rim Binding Detail

The rim of this basket is strengthened and finished in an interesting manner (figs. 399, 400). The open edge of the side weave is first finished by twisting the thin warp elements, which extend above the last weft element, before tucking each end back into the side weave. The rim is then strengthened by sandwiching the side weave between four rings of half-cane split. There are two rings on the inner surface and two rings on the outer surface. The sets are located one above the other. Corresponding rings are bound to each other through the side weave by split-cane binding with the knots appearing between the two outer rings. The gap between the two concentric rims forming the upper edge of the rim (which amounts to the thickness of the side weave) is covered by a fibrous rope made by twisting two strands of split cane. This rope locks into the split-cane binding which passes over the rim at periodic intervals. This locking is achieved by the binding elements passing between the pair of twisted strands making up the rope. This rope detail also ensures that the split-cane binding is not worn out by friction when the basket is stored upside down with the rim touching the ground, as it cannot stand on its base.



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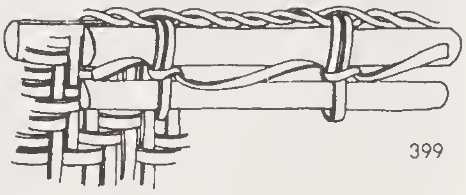

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395: The *khu*, an Ao Naga basket.

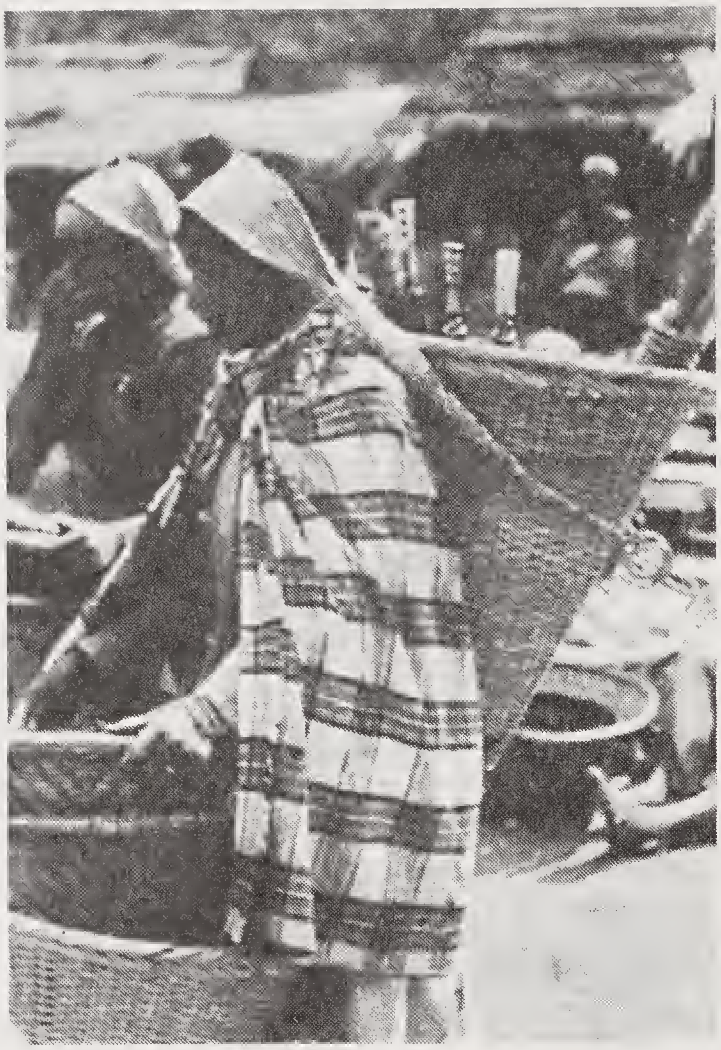
396: The Nishi basket resting on its rim.

397: The width of the braided head strap is reduced by using three elements as one.

398: The basket is woven in a decorative twill pattern.

399: Detail of the rim binding.

400: Movement of the cane split used to bind the rim.



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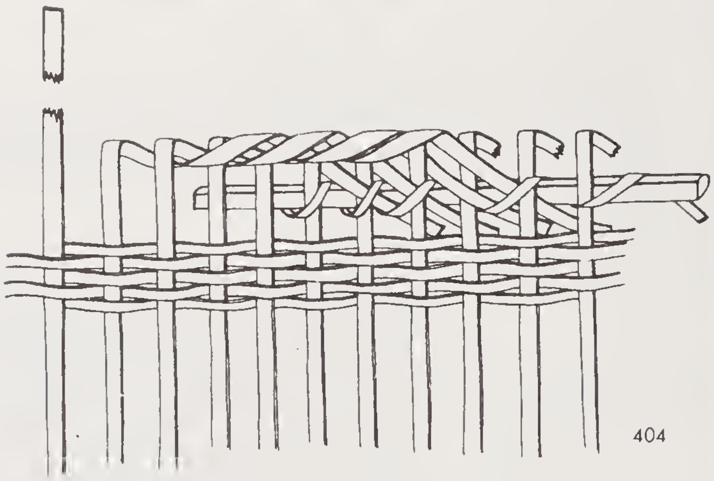

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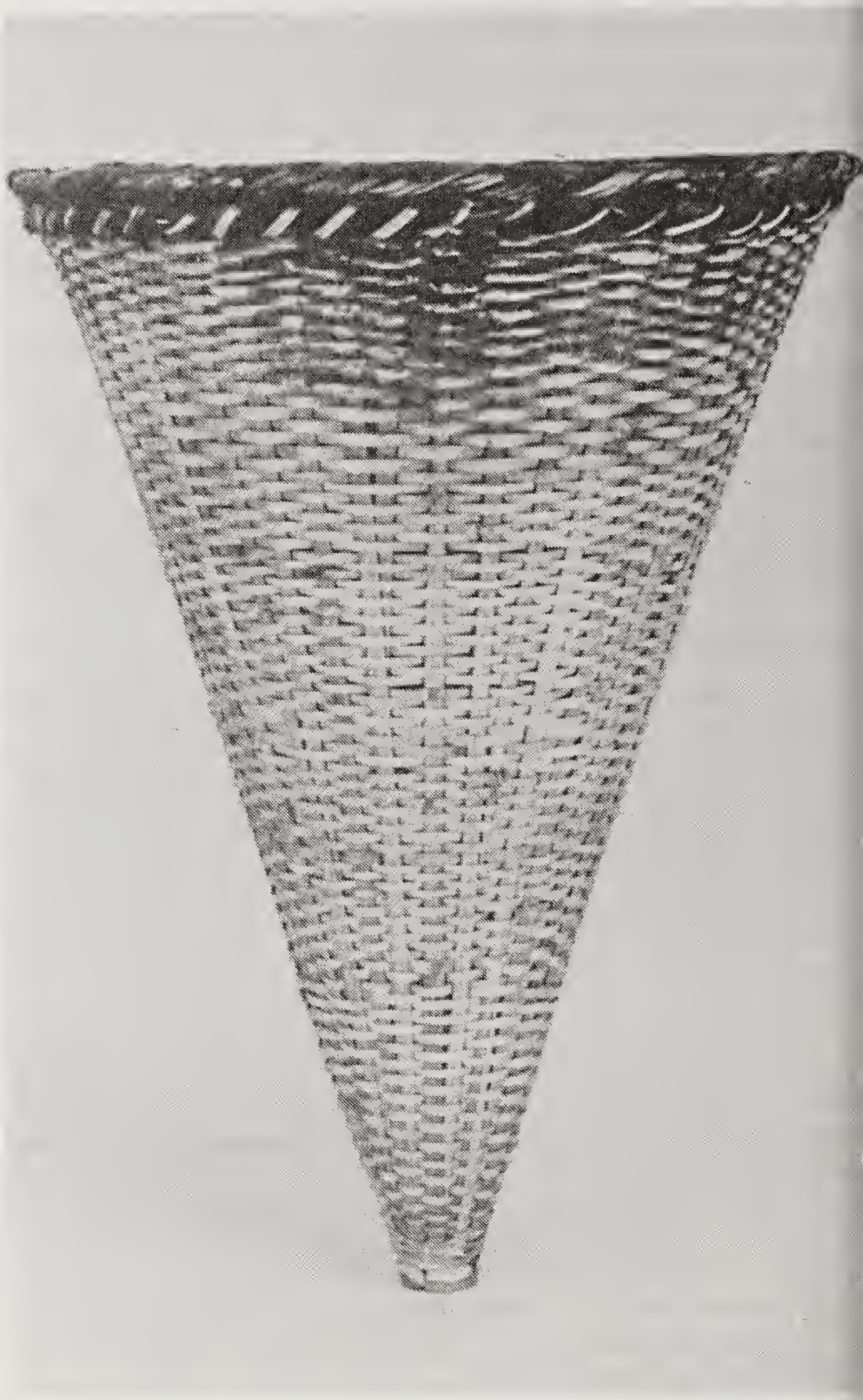

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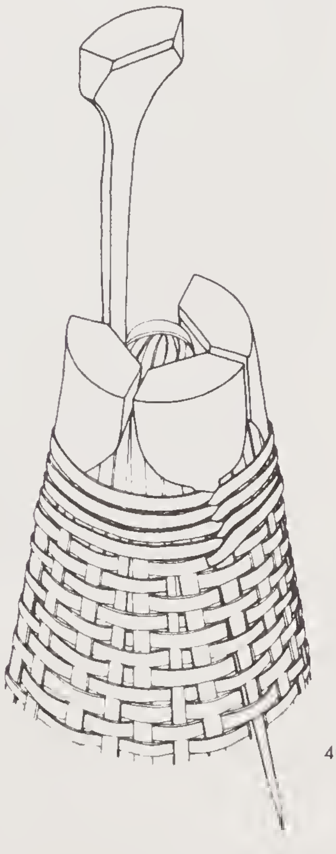


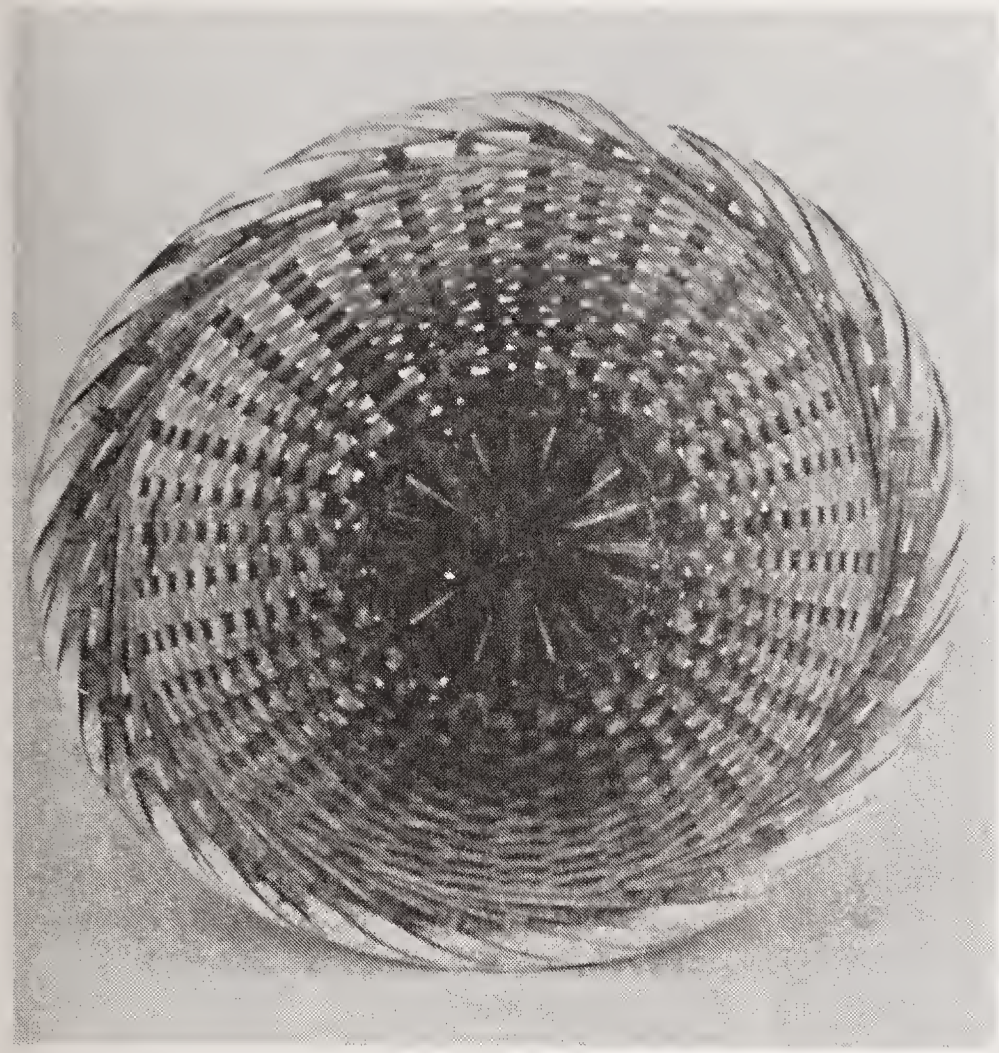
403

Khoh

The *khoh* is a coarse, closed-weave basket used by the Khasi tribe of Meghalaya for general-purpose marketing (fig. 401). This basket is carried on the back by a head-strap (fig. 402). The rim is a circle of diameter 420 mm and the sides taper down sharply along a straight line to form a point at the base. The height of the basket is 620 mm.

Side Weave

The warp elements in the side weave are bent sharply at the base, before continuing up the opposite side. Several such elements overlap radially to form the pointed base. These are made from bamboo outer splits that are wide and fairly thick. The outer layer faces the inside surface of the basket. The weft element forms a continuous upward spiral weaving in and out of the warp elements in a plain weave. The weft element is made from bamboo outer splits which are half the width and thickness of the warp elements. In the weft the outer layer of bamboo faces the outer surface of the basket.



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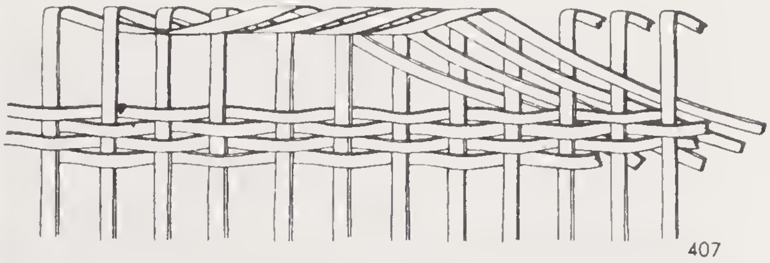

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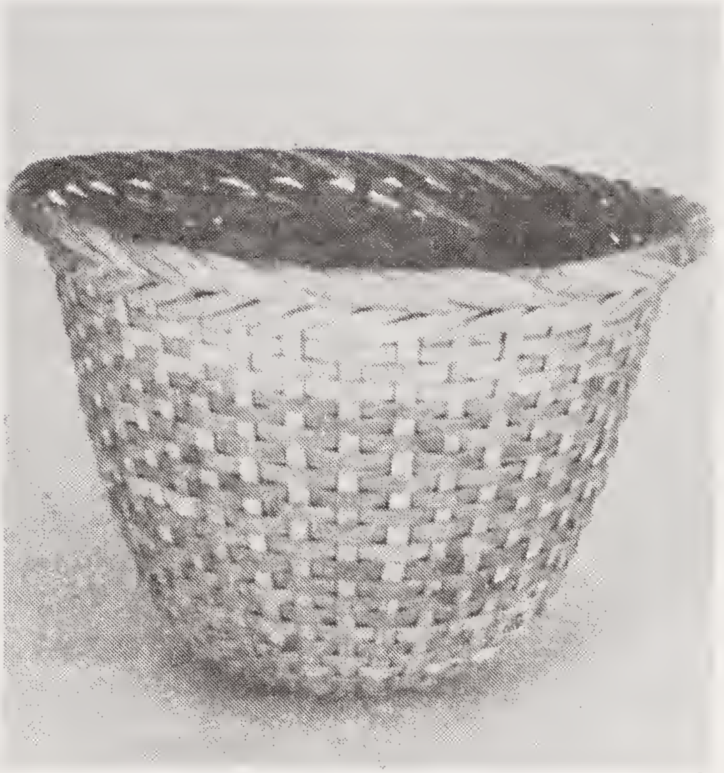


405

Base Strengthening

The base is strengthened by four splints of bamboo including a node at one end while the other end is shaped like a long stake. One-fourth of the node is retained in each splint. These stakes are inserted into the weave, while the nodal parts of the four elements are arranged to form a small circle at the base (fig. 403).

Self-Strengthened Rim

The upper edge of the rim is self-strengthened. All the warp elements extending above the last weft element are twisted so that they are horizontally in one direction forming a tight helix. The helix locks into several warp elements before passing over and under two consecutive warp elements, and its end lies inclined on the inner surface of the basket. The smooth outer layer of the bamboo appears on the outer surface of the helix. Just below this helical rim, the edge is further strengthened by a ring made of stout bamboo split. This is bound to the side weave by a thin binding element made from bamboo outer split. The binding holds firmly to the rim, the topmost part of each warp element, and the inclined end of the returning warp elements (fig. 404).

Khasi Fruit Basket

This basket is used for packing and transporting fruit and vegetables. It is similar in structure to the *khoh* (fig. 405). The form of this basket is like a parabolic dome. The circular rim has a diameter of 350 mm and the height of the basket is 300 mm.

Weave Structure and Rim

Wide outer splits of bamboo are used in the warp, overlapping radially to form the base (fig. 406). The smooth outer surface of the warp faces the inside to form the basket. These warp elements are taken in pairs at the base, after which they fork out, to become two separate warp elements on

401: The *khoh*, Khasi basket.

402: A Khasi woman carrying a *khoh*.

403: An exploded view showing the bamboo splints inserted at the base.

404: A schematic view showing how the rim is constructed.

405: The Khasi fruit basket.

406: The Khasi fruit basket as seen from above.

407: A schematic view showing the construction of the rim.

opposite sides of the base. Only one pair remains parallel to move up one side in order to create an odd number of warp elements around the base. This condition is essential for a weft which is a single-start spiral to be able to weave in and out of consecutive warp elements and continue around the basket. The first few turns of the weft spiral is made from fairly thin bamboo splits. Subsequent turns use weft elements which are almost the same width as the warp though the thickness is less. The rim is a self-strengthened helical construction as in the *khoh,* though the stiff bamboo ring and binding are not used (fig. 407).

Tea Basket from Assam

The tea-picking basket was seen in use in tea gardens around Mariani in Assam (figs. 408, 409). It is a tall cylinder with a hemispherical base and is made from coarse bamboo splits. These baskets are used in large quantities by women workers in tea gardens and are carried on the back with the aid of a head-strap. The warp elements overlap radially at the base and the weft is a double-start spiral, each weaving in and out of consecutive warp elements. At the rim the warp elements are twisted and bent back at an angle, before the edge is bound to a stiff ring made from split bamboo. The ring is used only on the outer surface of the basket.

Mekhpajhong

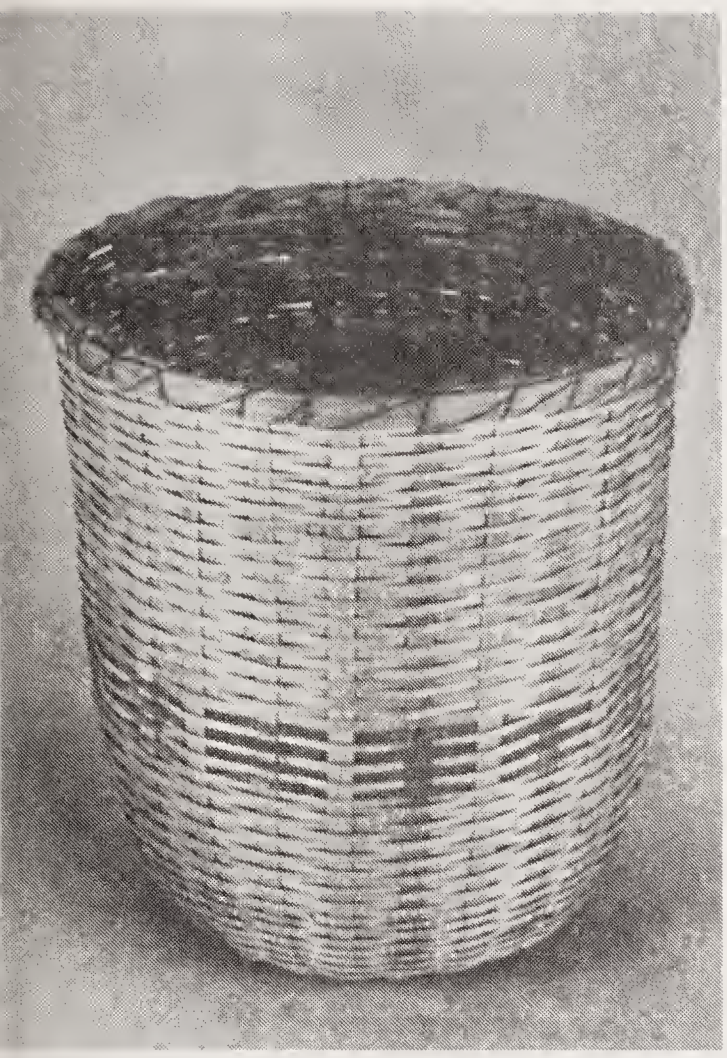
The *mekhpajhong* is a closed-weave carrying basket used by the Monpa tribe of Arunachal Pradesh (fig. 410). The basket is made entirely from bamboo outer splits from the only locally available species which has a small culm-diameter and small wall-thickness. Larger species of bamboo do not grow at the fairly high altitudes that the Monpas inhabit, hence their products have taken forms and structures suitable for the locally-available material.

Size, Shape and Structure

The basket has a square base of diagonal 190 mm and its sides move vertically for a short distance near the base before they flare out to a large circular rim of diameter 400 mm. The height of the basket is 520 mm. A combination of weaves is used in its construction. The base is woven in a simple basket weave with an open structure and a pair of strips forms each element of the base weave. After the base is woven, the extending ends are bent up to form the warp. On the sides, at the vertical part near the base, these elements are woven in an open-hexagonal weave. Two rows of elongated hexagons are formed, before the inclined elements forming the top of each hexagon in the upper row overlap to continue as one vertical element all the way upto the rim. The weft is formed by a pair of splits taken as one element, moving up the side in a spiral and locking the inclined elements of the open-hexagonal weave before individual splits in the weft element separate to continue as a double-start spiral, weaving alternately in and out of the vertical and parallel warp elements in a tabby weave.

Side and Base Strengthening

The side and base of the basket are strengthened using bamboo splits with the same cross-section as the main warp and weft elements. This is done in an unusual but effective way using bamboo splits which are quite long. Each split is bent double and hooked to the spiralling weft located between the open-hexagonal weave and the tabby weave of the side. Each end of the additional split is taken down the side, inclined in opposite directions and parallel to the existing inclined elements, each weaving in and out of the existing open-hexagonal weave and forming one diagonal of the respective hexagons. These additional warp elements interlace with the existing inclined elements as well as among themselves, in the order in which the crossings take place.



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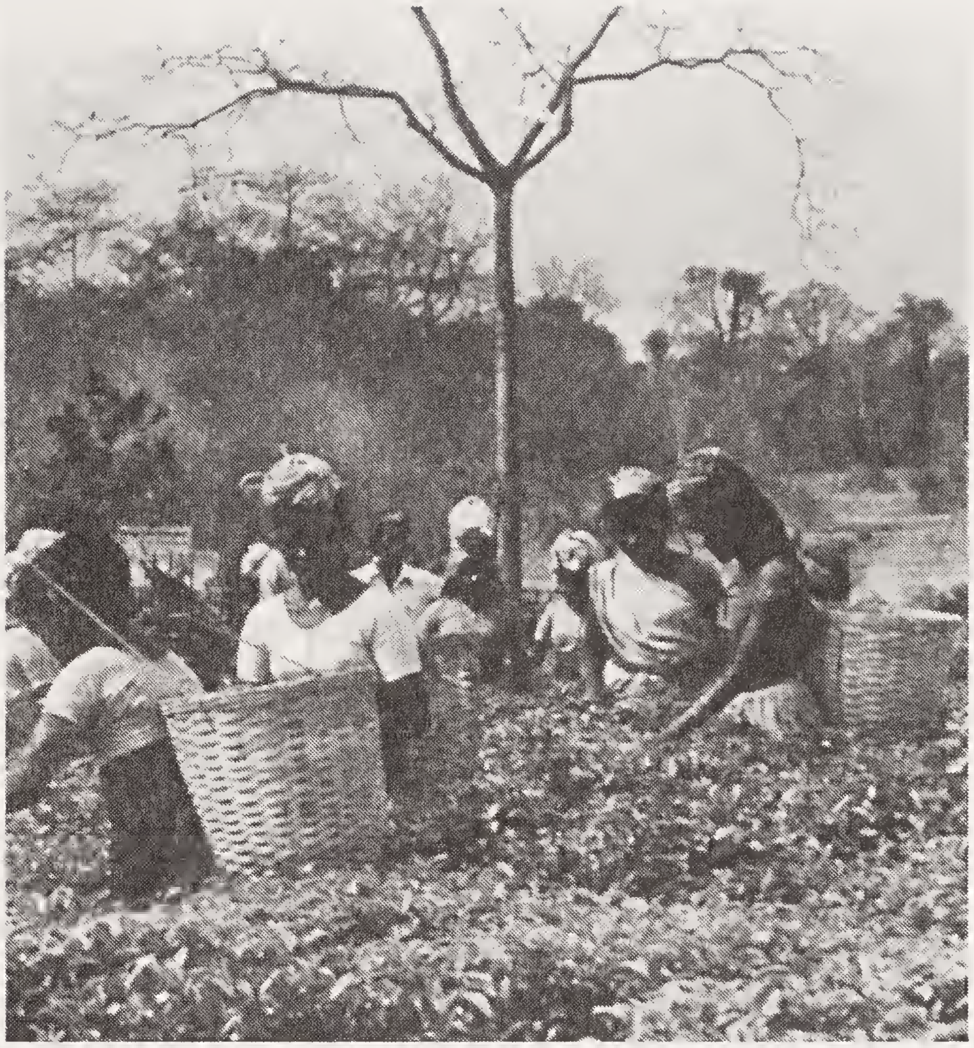

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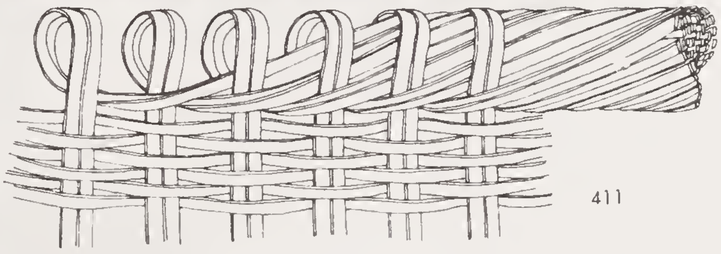

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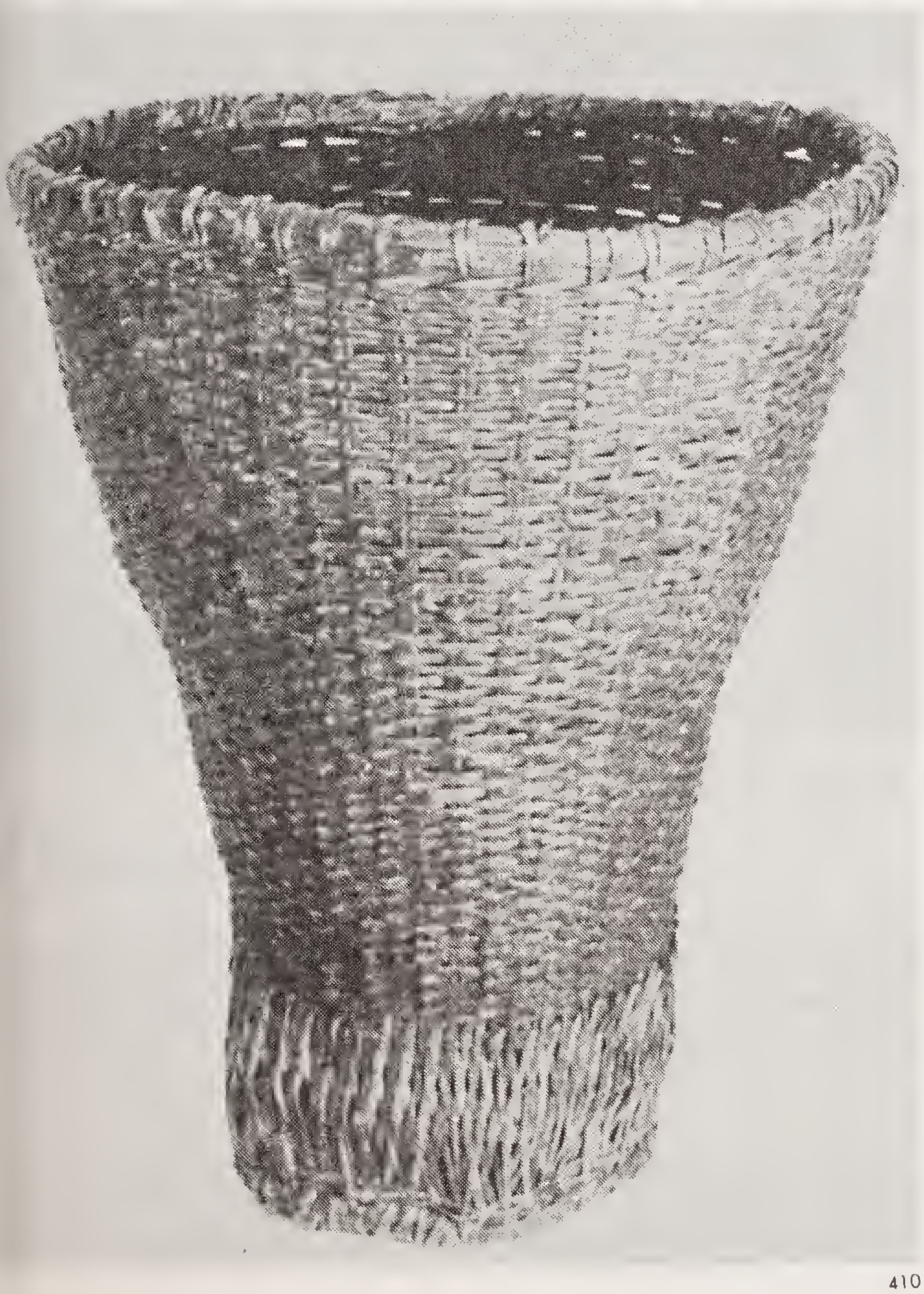
408: A tea basket from Assam.

409: A typical scene from a tea garden in upper Assam.

410: The *mekhpajhong*, a Monpa basket.

411: Detail of the self-strengthened rim.

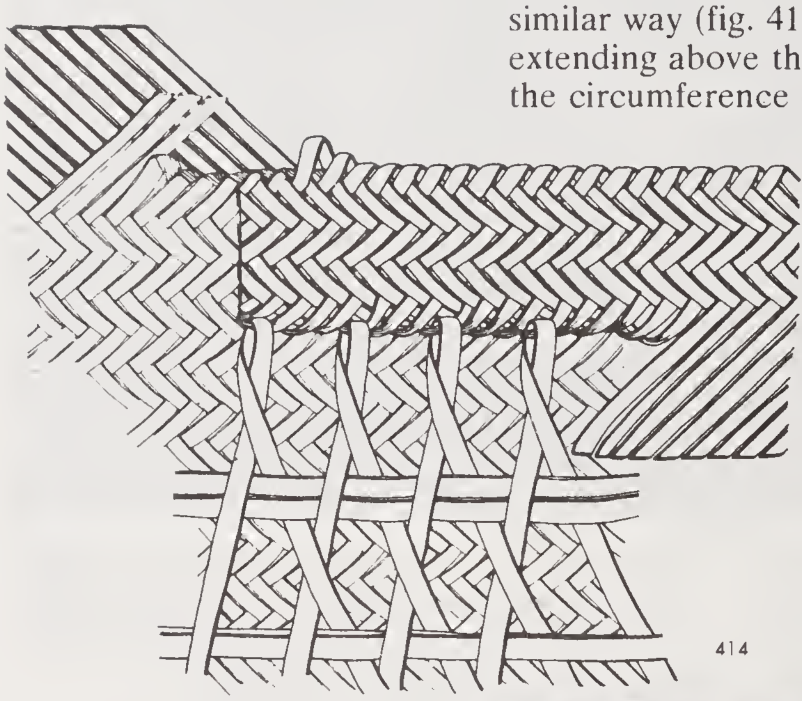


410

Rim

The open ends of these additional elements are used to make a thick self-strengthened rim which runs around the perimeter of the base square. Here, the pair of additional warp elements that meet near the base of each hexagon, in the lower row of hexagons, are taken together to form a looped knot, before the remaining length is made to run along the perimeter of the base square in one direction. These form the passive core of the thick rim. In the beginning the core of the rim is fairly thin, but as more of the subsequent elements are added to the core the thickness increases. As the construction of the rim progresses around the perimeter to return to the point where it started, the thickness of this rim is equalised by overlapping the thin part to a sufficient length.

The self-strengthened rim at the upper edge of the basket is made in a similar way (fig. 411). Here, the length of the vertical warp elements extending above the last weft element is used to form the thick rim around the circumference of the basket.



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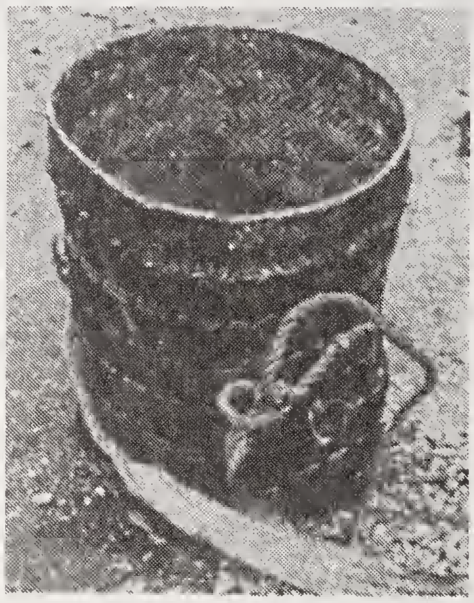

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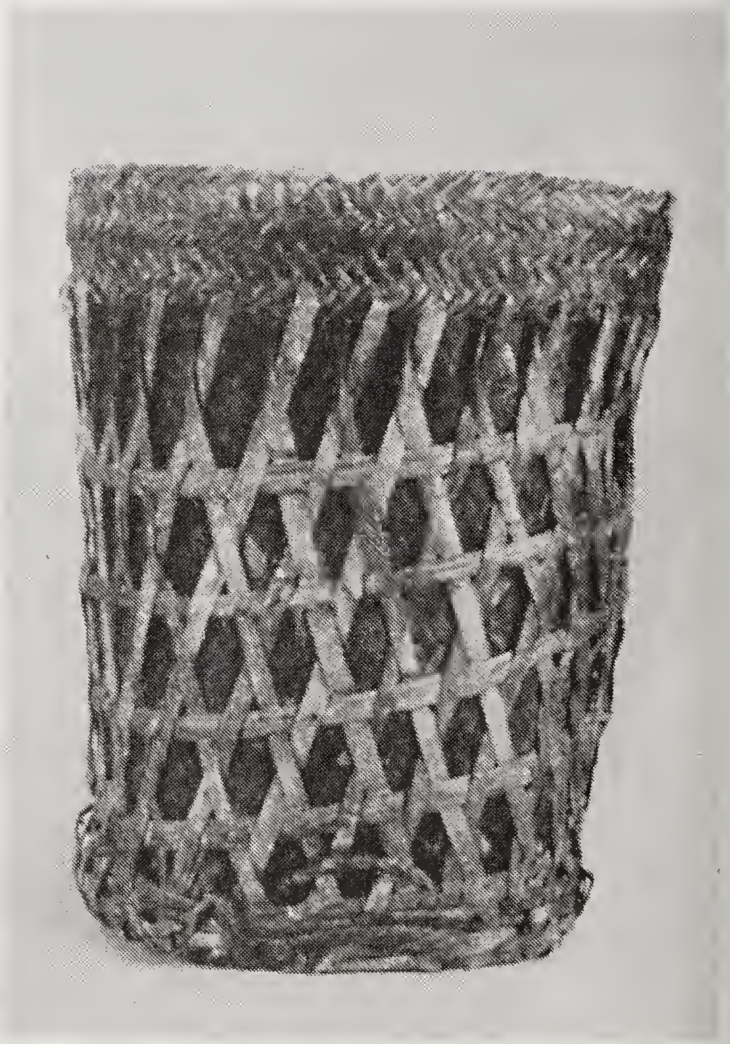


412

412: The Sherdukpen grain basket.

413: The inner wall is woven in the diagonal weaving method, while the outer wall is an open hexagonal weave.

414: At the rim, the inner layer is folded outwards, and the elements of the hexagonal weave are hooked into it.

Sherdukpen Grain Basket

This basket is used by the Sherdukpen tribe of Arunachal Pradesh to carry paddy and grain (fig. 412). It is made from bamboo splits, using a species with a small diameter and wall thickness. The Sherdukpens and Monpas are neighbours and have similar constraints in terms of availability of large bamboos. They seem to have influenced each other in the types of structures evolved from the available thin-stemmed bamboos.

Size and Shape

This basket has a rectangular base of sides 270 mm by 220 mm and the sides move almost vertically upwards to form an elliptical rim of major axis 320 mm and minor axis 260 mm. The height of the basket is 420 mm.

Double-Wall Structure

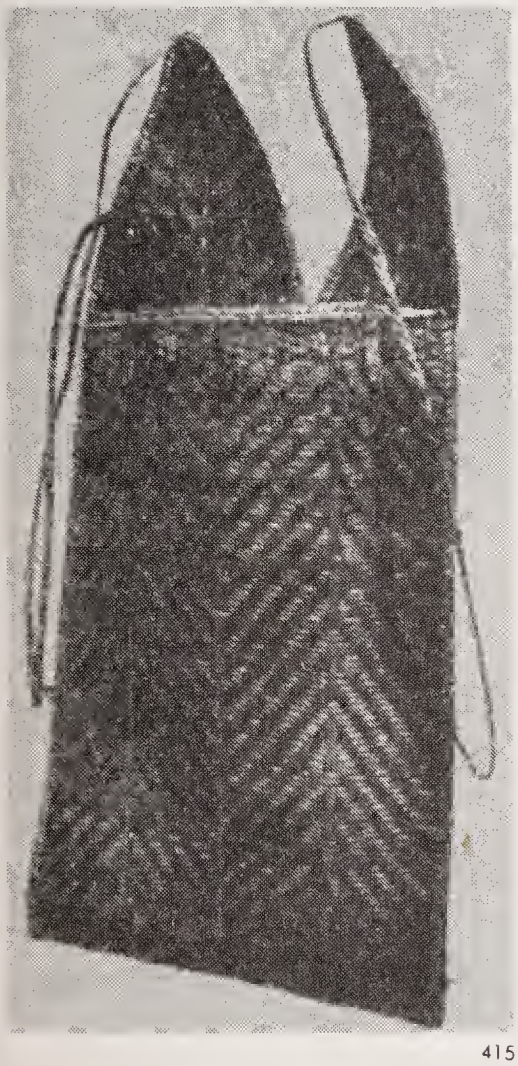
A double-wall structure is an interesting feature of this basket (fig. 413). The inner wall which forms the base, sides and rim is woven using the diagonal-weaving method. The outer wall is made in an open hexagonal weave, the top of which is anchored at a series of points formed by the inner mat folding over the upper edge of the basket to return down the outer side for a short length, like a sleeve. Hence the inclined elements of the outer hexagonal weave structure are hooked into the edge of this rim-sleeve (fig. 414). This hexagonal structure is woven, starting from the upper rim, to be interlaced by a weft which spirals around the basket, moving from rim to base.

The inclined elements of the open-hexagonal weave are long enough to extend well beyond the base formed by the inner wall of the basket. These elements are taken two at a time and bent into a looped knot, to form the thick self-strengthened rim. The part of the element extending beyond the looped knot forms the core of the self-strengthened rim. This construction is identical to the rim of the Monpa *poshong* and *mekhpajhong* (fig. 411). The smooth outer layer of the split bamboo faces the inside of the basket when woven in the inner layer and the outside of the basket when used in the outer open-hexagonal weave.

415: The *ronak*, a Tagin haversack seen at the museum at Hopoli.

416: The *lera*, an Apa Tani haversack seen at the museum at Hopoli.

417: The *nera*, a Hill Miri haversack seen at the museum at Hopoli.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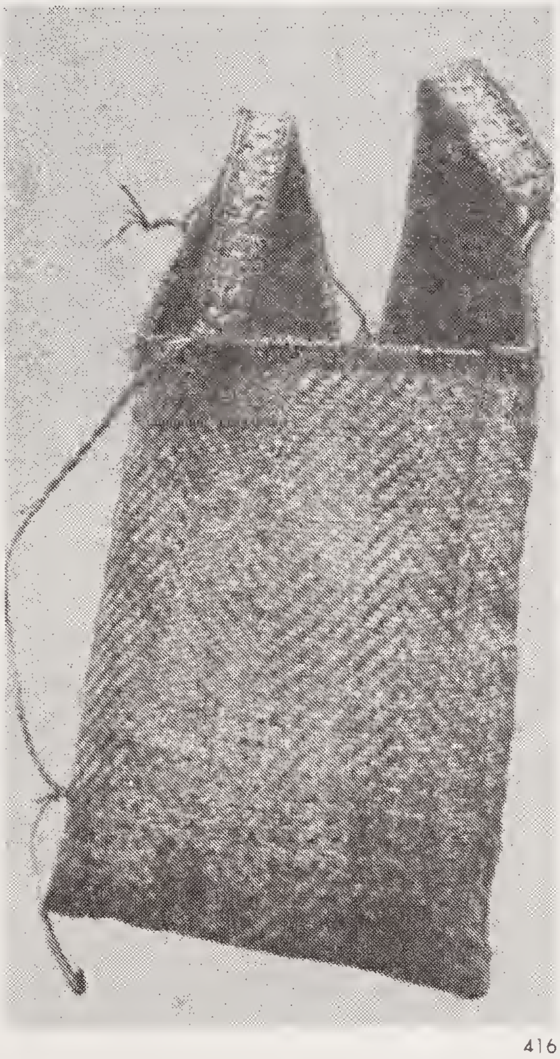
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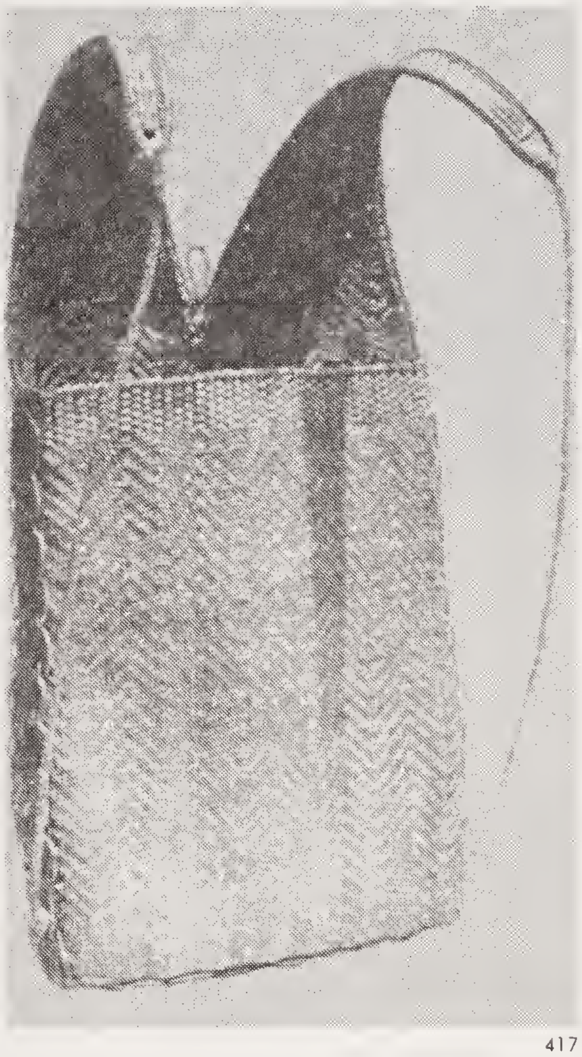
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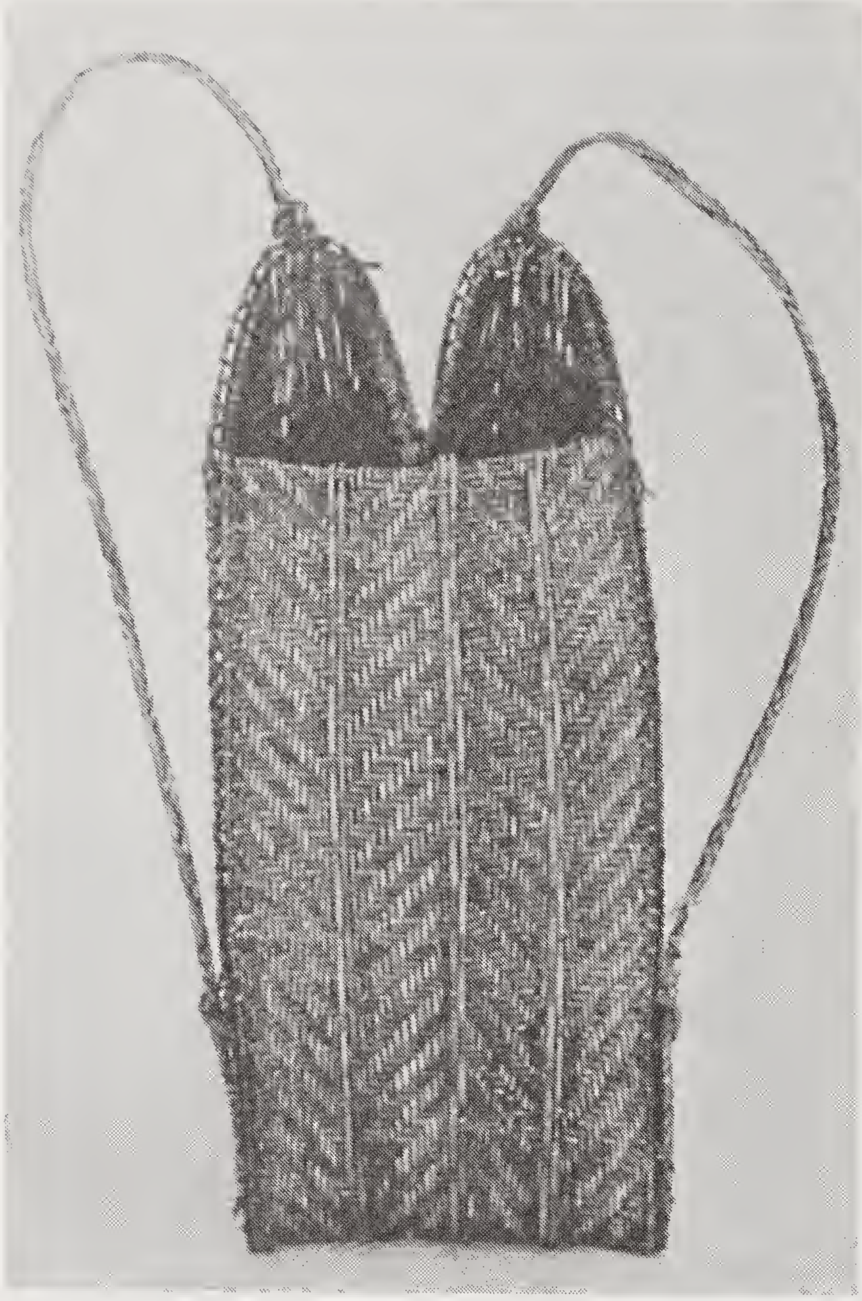
Haversacks

Several tribes in the northeastern region use haversacks made of split cane or bamboo. These are used to carry a few personal belongings on journeys outside their villages. They are used exclusively by men as they are the ones who journey out on hunting expeditions or to select new sites for fields or even a new site for their home. These haversacks are used as some other tribes would use their cloth sling bags. The haversacks, as the name suggests, are carried hung over the back using two shoulder straps. Some haversacks are provided with an additional strap, so that they can be used like a sling bag, to be hung from one shoulder.



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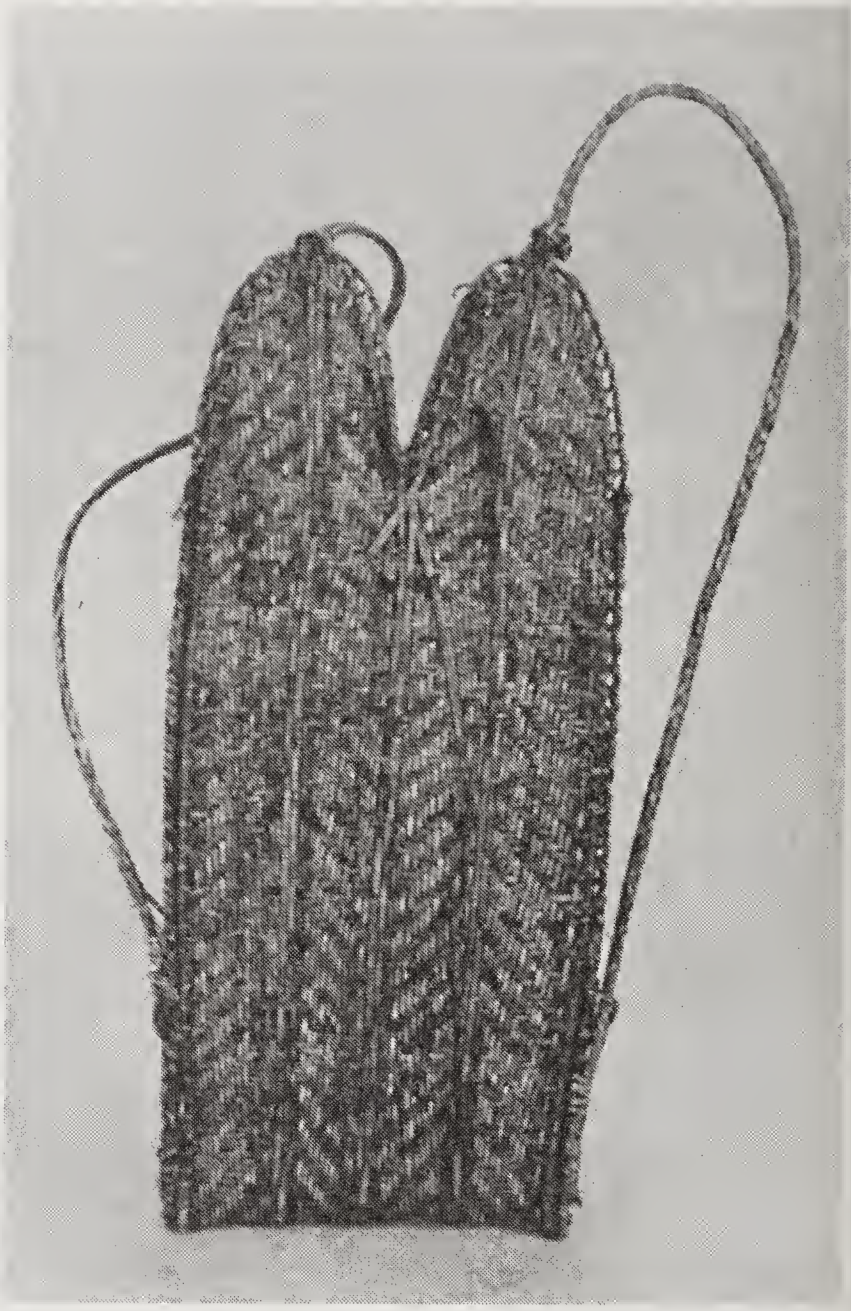

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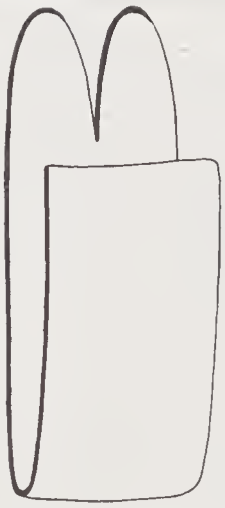


420

418: The *rathak*, an Adi Gallong haversack.

419: The *rathak* as seen from the back.

420: A long mat is folded and the edges are stitched together with split cane.

Shape and Structure

In general, these haversacks have a form like a deep rectangular pouch open from the top. The side of the haversack that is in contact with the back of the person is stopped earlier while the other side extends upwards in height and receives the ends of each shoulder strap. The other ends of each shoulder strap are attached to a point lower down, where the front and back surfaces of the haversack meet. The back surface which extends above tends to cover the opening at the top when the haversack is worn.

Documentations prepared by several anthropologists in the past indicate that several tribes spread all over the region traditionally used such haversacks. However, during this extensive survey, it was seen in use only in Arunachal Pradesh and in museums in that Union Territory. During this survey three examples were acquired by the team. These are the *nara* used by the Nishi tribe of Subansari District and the *rathak* and *pathu*, both of which are used by the Adi Gallong tribe of Siang District. Those seen in museums include the *ronak* used by the Tagin tribe from Daparijo, the *lera* used by the Apa Tani tribe of Subansari and the *nera* used by the Hill Miri tribe at Tamen in Subansari District (figs. 415-417).

Rathak

The *rathak* is a haversack used by the Adi Gallong tribe of Arunachal Pradesh. It is made from split cane. Shaped like a long rectangular pouch, the haversack is open at the top (figs. 418, 419).

Size and Shape

The height of the rectangular side is 430 mm from base to rim while the height of the side with a double arch-shaped edge is 570 mm. The width of the haversack is 260 mm and its thickness is 30 mm.

Structure and Construction

The splits are first woven into a long mat, which is folded in the middle, before the side edges of the two overlapping surface are stitched together by split-cane binding (fig. 420). The mat is woven using warp and weft strips of uniform dimension. The weave has a herringbone-twill structure. The warp is formed by a series of individual elements placed parallel to each other. The weft is a continuous element which interlaces the warp elements while crossing these at right angles, before being looped to knot around a thick border-stiffening element to return across the face of the weave. This construction at the edge forms a strong selvedge as in woven fabrics. In the process of passing through the looped knot, the weft is twisted so that the outer smooth layer of the cane split is always facing the outer surface of the mat. The outer layer of the warp splits also lie in the same direction. The ends of the warp elements are bent over the last weft of the mat and tucked back into the weave to move along the lower surface.

Strengthening Details

The mat is strengthened by pairs of extra-warp elements which intermittently weave into the weft and lie on the upper surface of the mat. Three such pairs of extra warp elements are used, dividing the surface into four distinct bands, each appearing at the crest or trough of the repeating herringbone-weave pattern. The selvedge of the mat is further strengthened by a thick cane split. This split is held down by a split-cane binding, which in turn is twined around a second split, running parallel to the mat edge at a uniform distance. This binding creates a raised border which is quite decorative. The stitched seam on either sides of the haversack is accomplished by binding two such borders that overlap when the mat is folded. A length of split cane twines around the raised parts of both borders simultaneously to lock the edges firmly.

Braided Straps

The shoulder straps are made from cane splits in a circular braiding which has the same visual quality as the herringbone pattern used in the side weave. These straps are knotted to the haversack with one end of each strap near the base and the other end at the top of the arch-like extensions at the top.

Pathu

The *pathu,* another haversack used by the Adi Gallong tribe, is made from split cane. It employs a different method of construction and is thicker and wider than the *rathak.* The *pathu* is woven like a basket, from base upwards to the rim, using the diagonal-weaving structure used in baskets (fig. 421).

Size and Shape

The *pathu* is 320 mm wide and the height of the short side is 360 mm while that of the tall side, measured from base to top of the arc, is 470 mm. The two sides meet at three edges but bulge out to a maximum thickness of 120 mm at the centre.

Structure and Construction

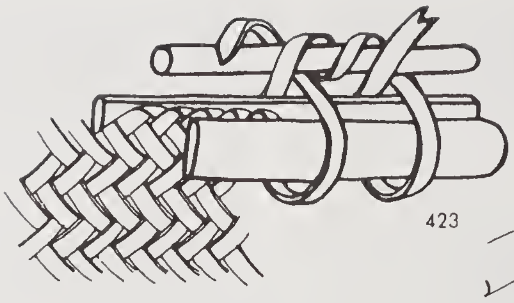
The *pathu* is woven like a deep rectangular pouch with the base forming a single straight line. The two sets of split-cane strips which interlace at the

421: The *pathu*, another Adi Gallong haversack.

422: Detail of the horizontal rim at the mouth of the *pathu*.

423: The movement of the cane split used in this binding.

424: Detail of the arched portion of the rim.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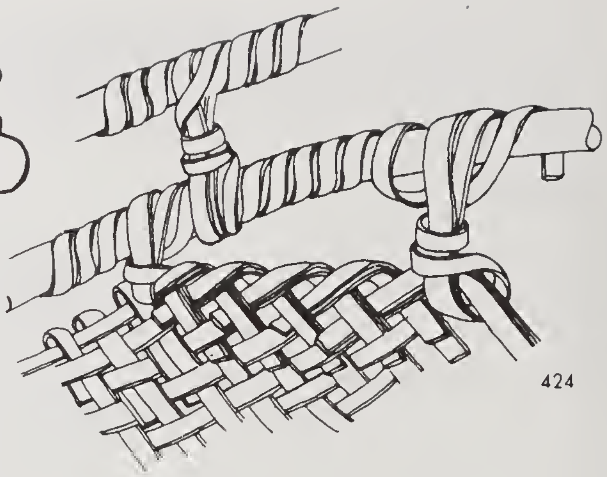
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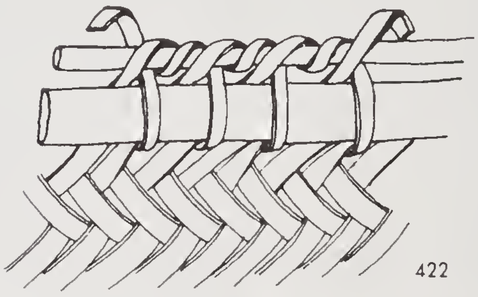
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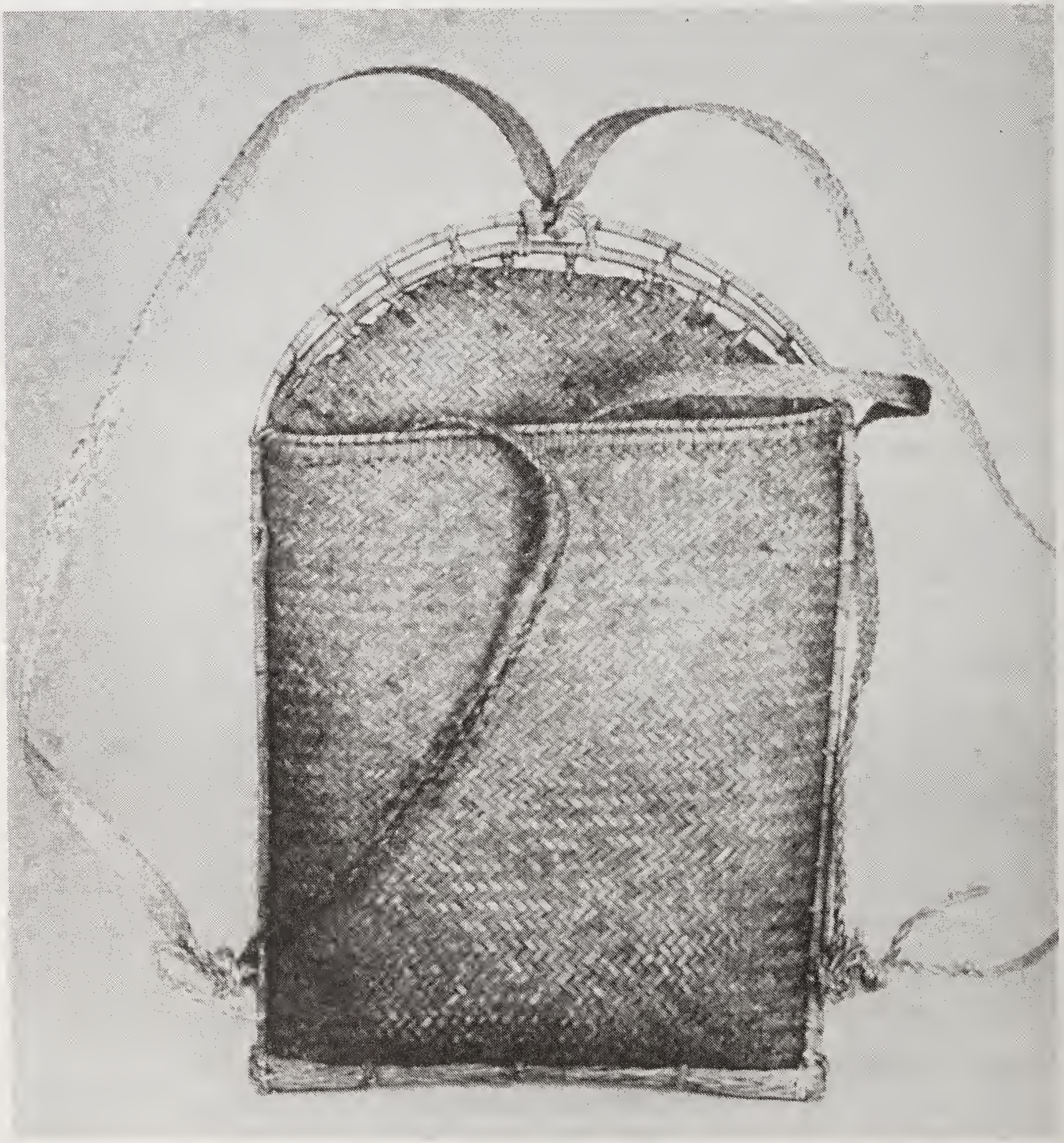
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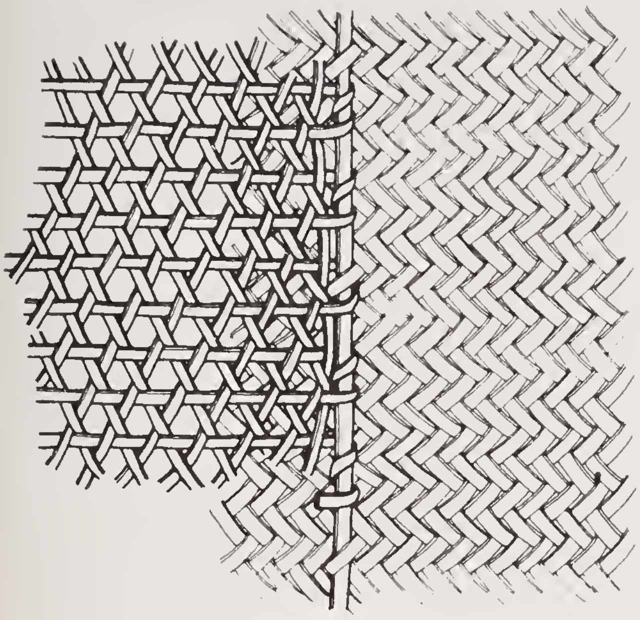

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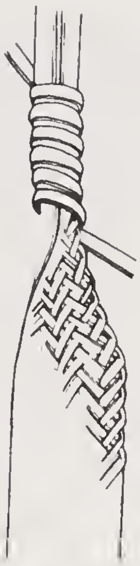

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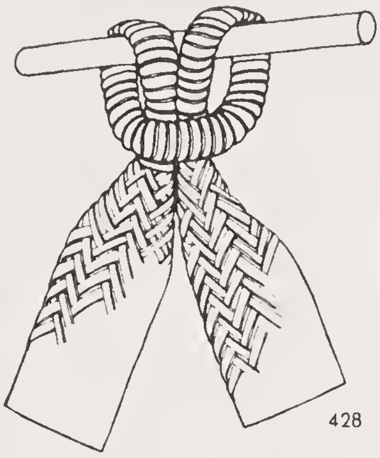


428

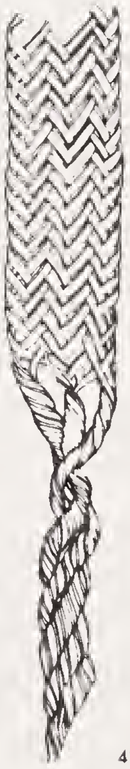
425: The back portion has a waterproof layer sandwiched between the inner layer and the open hexagonal weave.

426: The horizontal elements of the hexagonal weave are locked into the side weave.

427: A split cane is wound tightly around the braided strap to make it tubular.

428: This central portion is knotted over the top of the arch.

429: The ends of the braided strap are twisted into fibrous rope.



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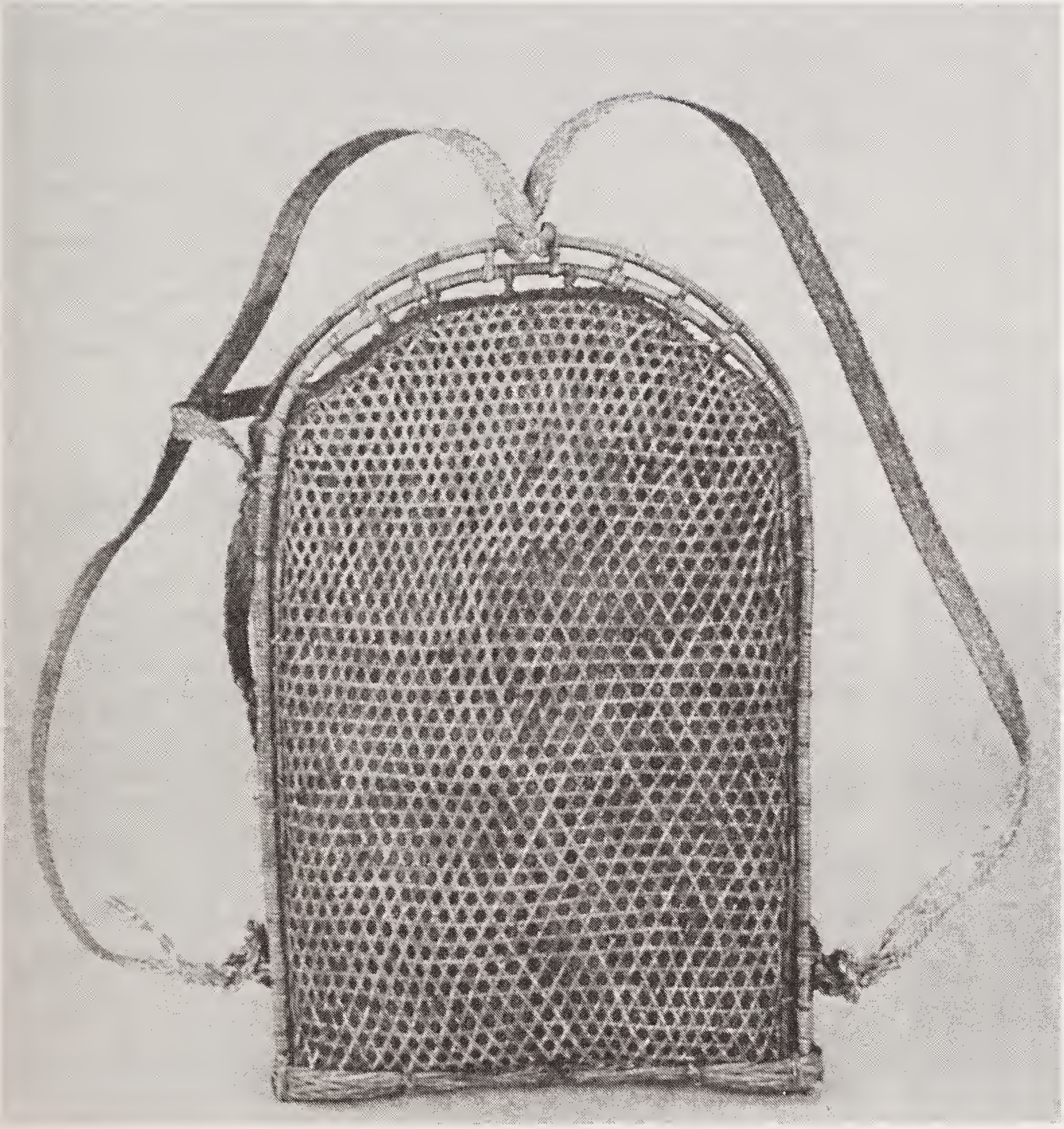


425

base extend up both sides of the haversack. Each set is inclined in opposite directions, moving diagonally up the sides and interlacing in a two-up-two-down twill structure. The ends of the splits, on reaching the edge of one side, are bent to move diagonally up the other side, each set maintaining its clockwise or anti-clockwise movement while interlacing to form a continuous surface.

Rim and Edge Strengthening

The edge of the rim on the side in contact with the back of the person is stopped as a horizontal line which is strengthened by a border (figs. 422, 423), while the other side extends above this level in a shallow arc (fig. 421). A pair of side-strengthening elements runs up one edge of the haversack, both moving parallel with a uniform gap between them. On passing the horizontal rim, the two elements move into one place to pass around the arch-shaped edge of the back, before coming down the opposite edge of the haversack. These strengthening elements are wrapped by a split-cane binding, which after every few turns laces into the weave elements of the side. While passing over the arch-shaped edge, these bindings form an interesting row of knots that work both as an effective binding as well as a spacer element (fig. 424). The spacer maintains the gap between the two strengthening elements and a second row of knots links the inner element and the mat edge. The base of the haversack is protected from damage by abrasion by a continuous loop, braided with split cane to form a wide band which is held down to both sides near the base by cane binding.

Double-Wall Structure

The back surface of the haversack is made rainproof by superimposing a waterproof layer that is sandwiched between an outer layer woven in an open-hexagonal weave and the side weave (fig. 425). The horizontal elements of the open-hexagonal weave lock into elements of the side weave before returning horizontal to form the next row (fig. 426). The waterproofing layer in the acquired sample is a sheet of rubber-laminated cloth but other examples use traditional material such as leaves of a certain kind of palm tree.

Braided Strap

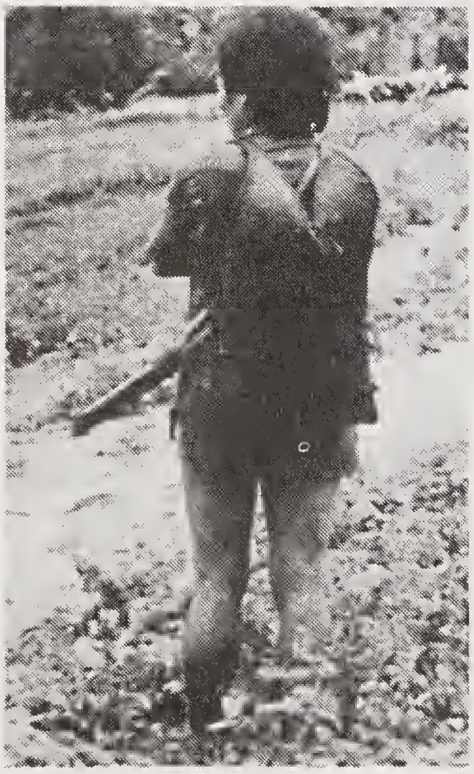
The shoulder-straps are made from a single, long, braided belt. At the centre of the belt, the braiding is folded, and a length of split-cane binding is wound tightly around it to create a circular cross-section (fig. 427). This part is knotted to the edge-strengthening element as it passes the top of the arc-shaped side (fig. 428). The open ends of the braided strap are transformed into twisted, fibrous ropes by first twisting elements taken in twos or threes followed by twisting of all three strands which are formed into a single rope (fig. 429). These ropes permit the strap to be knotted easily to a loop provided for this purpose near the base of the haversack.

430: The *nara*, a Nishi haversack.

431: The ends of each flap rest on the shoulders, covering the opening.

432: Detail of the binding along the edge of the flaps.

433: Detail of the binding at the base.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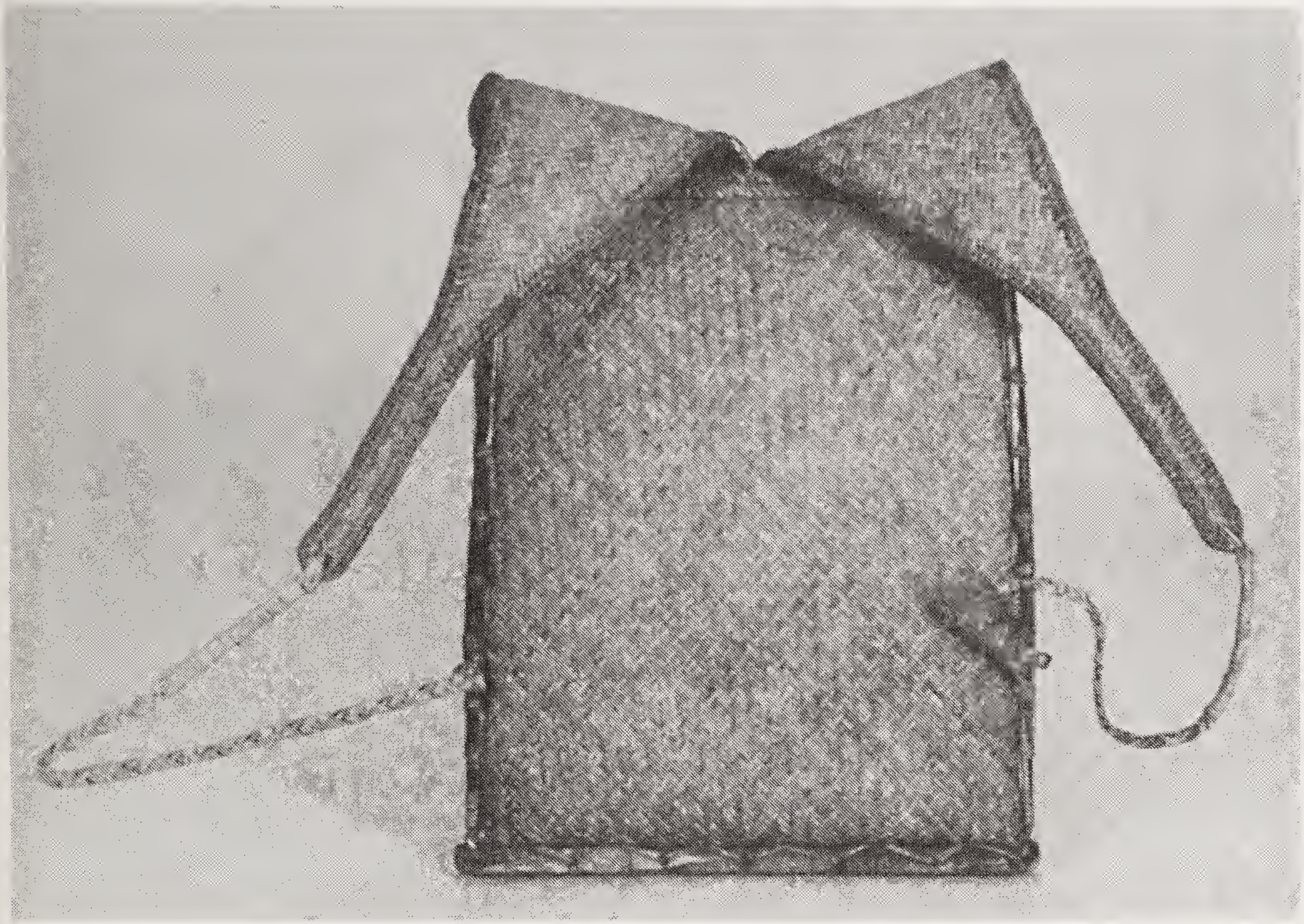
Nara

The *nara*, a haversack used by the Nishi tribe of Arunachal, is woven from split cane in the form of a deep rectangular pouch open at the top (fig. 430). The side forming the back of the haversack extends above the rim, in the form of elongated ear-like flaps, to which the braided shoulder-straps are attached. When worn, these flaps cover the opening and the ends of each flap rests on top of the shoulders (fig. 431).

Size and Shape

The *nara* is 360 mm in height and the flaps extend 340 mm above the rim. It is 300 mm wide and the two sides bulge slightly to form a maximum thickness of 60 mm.



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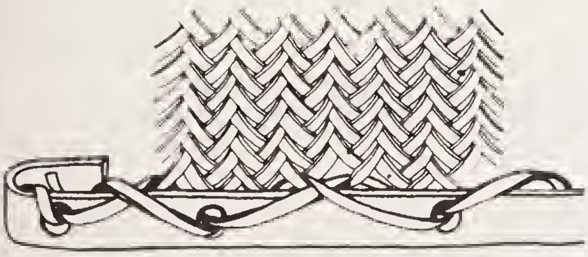

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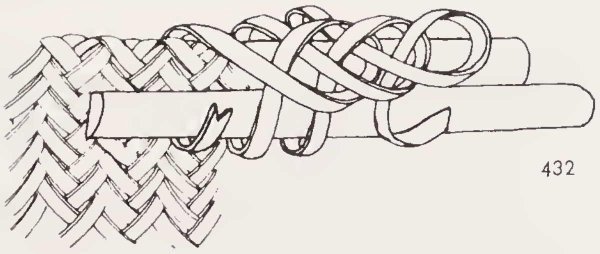


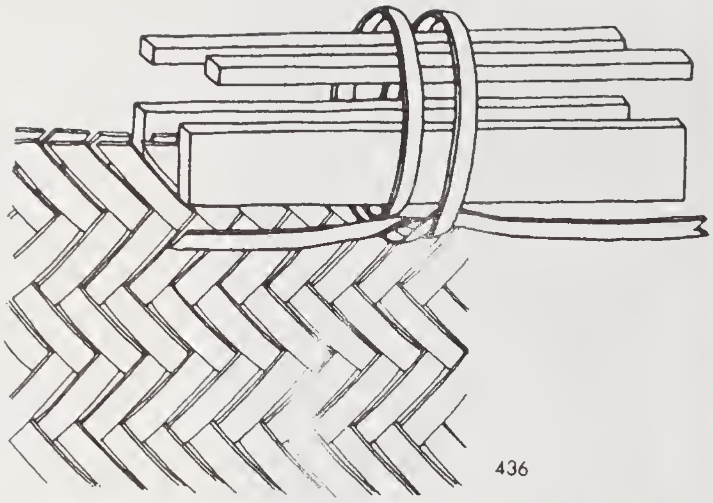
432

Rim and Edge Strengthening

The *nara* is woven from cane splits using the diagonal weaving method in a simple two-up-two-down twill. The open edge at the rim is finished by bending all the elements at the edge, with each element being tucked back into the weave structure for a short distance. The open edges of the flaps are strengthened by sandwiching the edge between two split-cane elements bound down by a decorative split-cane binding (fig. 432). The vertical edges of the haversack are strengthened, each by a whole cane element, thinned at both ends and bound to the side weave by split-cane binding.

Base Strengthening

The base of the haversack is protected from abrasion by a wide split taken from a length of cane of large diameter. This split is bent sharply at two points to form a loop and the open ends are tapered to overlap and close the loop. This loop is bound to the base by a pair of split-cane binding elements. Each split-cane element passes through a series of holes located along the centre line of the strengthening element (fig. 433). These holes are made by piercing the element with a red-hot metal poker.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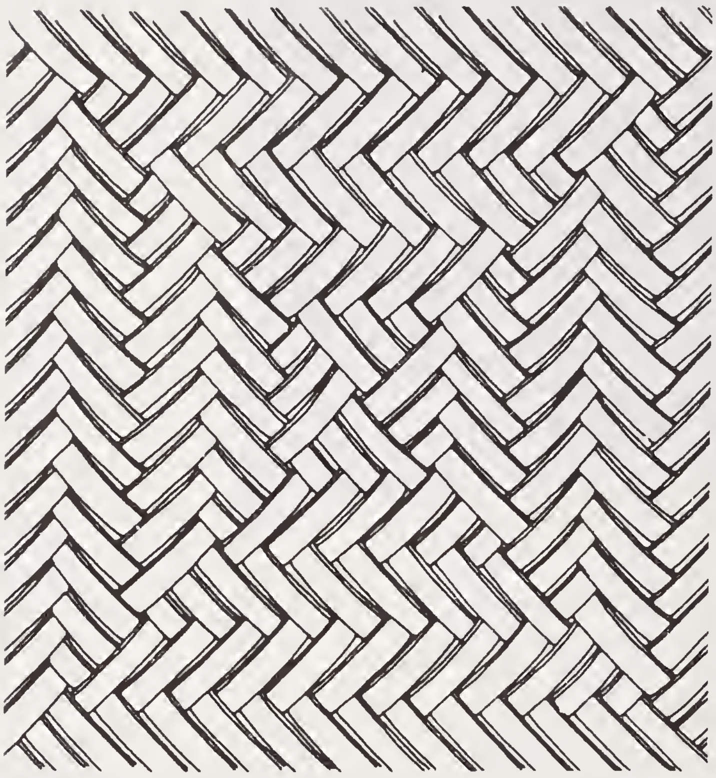
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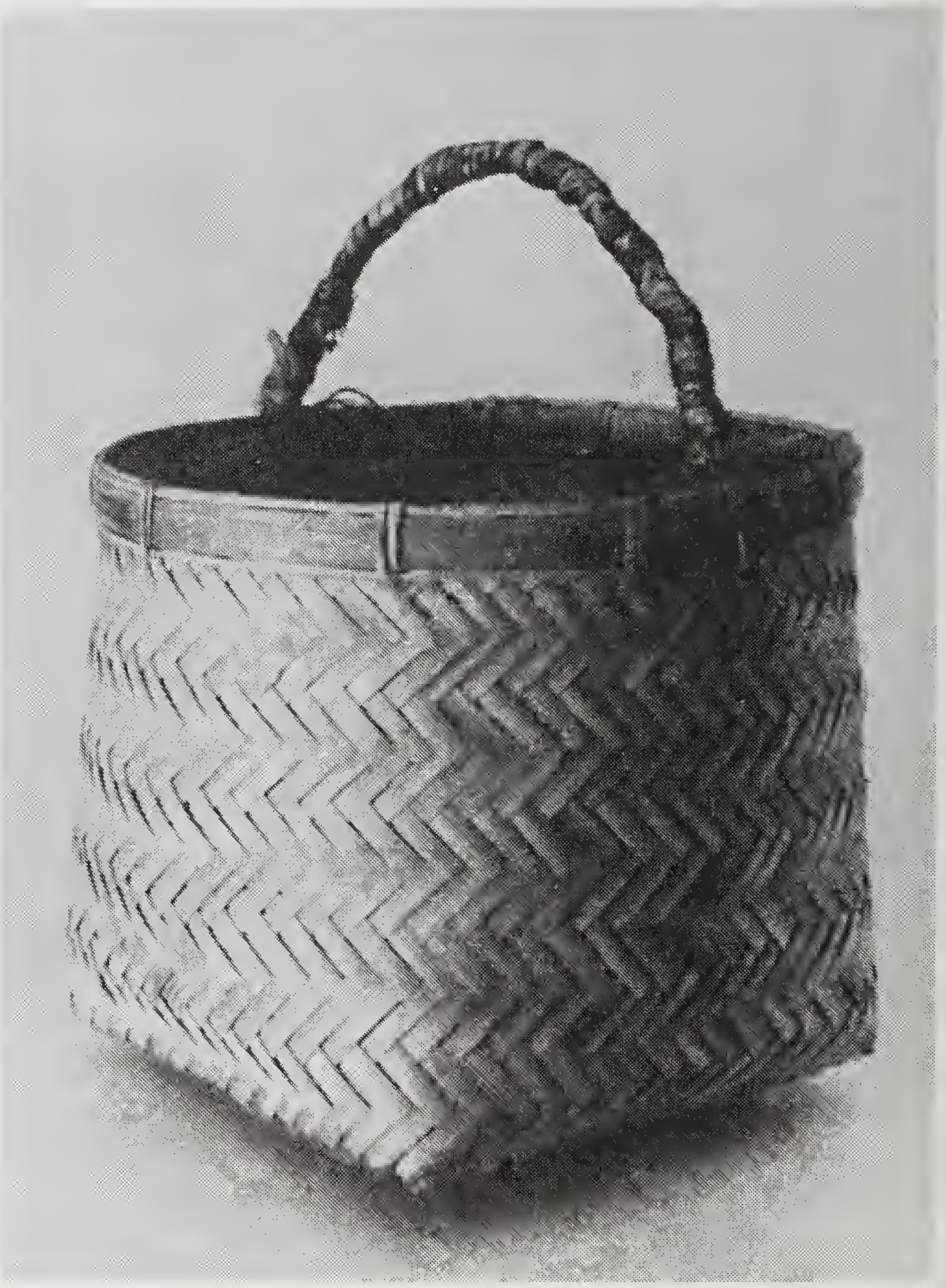

434

434: The *khaloi*, a basket from Assam.

435: The base has a concentric square pattern made by the diagonal weaving method.

436: Detail of the rim binding.

Shallow Carrying Baskets

Shallow bowls or dish-shaped baskets are used extensively for carrying a variety of things in the plains of Assam, Tripura and Manipur. These are either balanced on top of the head or suspended from a shoulder beam. Some baskets are provided with handles for carrying while in other cases handles are provided only for picking up the basket in the process of lifting it to one's head. Some hill tribes such as the Khasi tribe of Meghalaya and the Dimasa Cachari tribe of Assam's N. C. Hills District use baskets which can be classified with the shallow baskets of the plains.

Khaloi

The *khaloi* is used by the Assamese for carrying purchases from the bazaars (fig. 434). It is woven from wide splits of bamboo using the coarse inner layers in the diagonal-weaving method in a twill weave pattern. At the square base the weave pattern forms a series of concentric squares while up the sides they are seen as horizontal bands (fig. 435).

Size and Shape

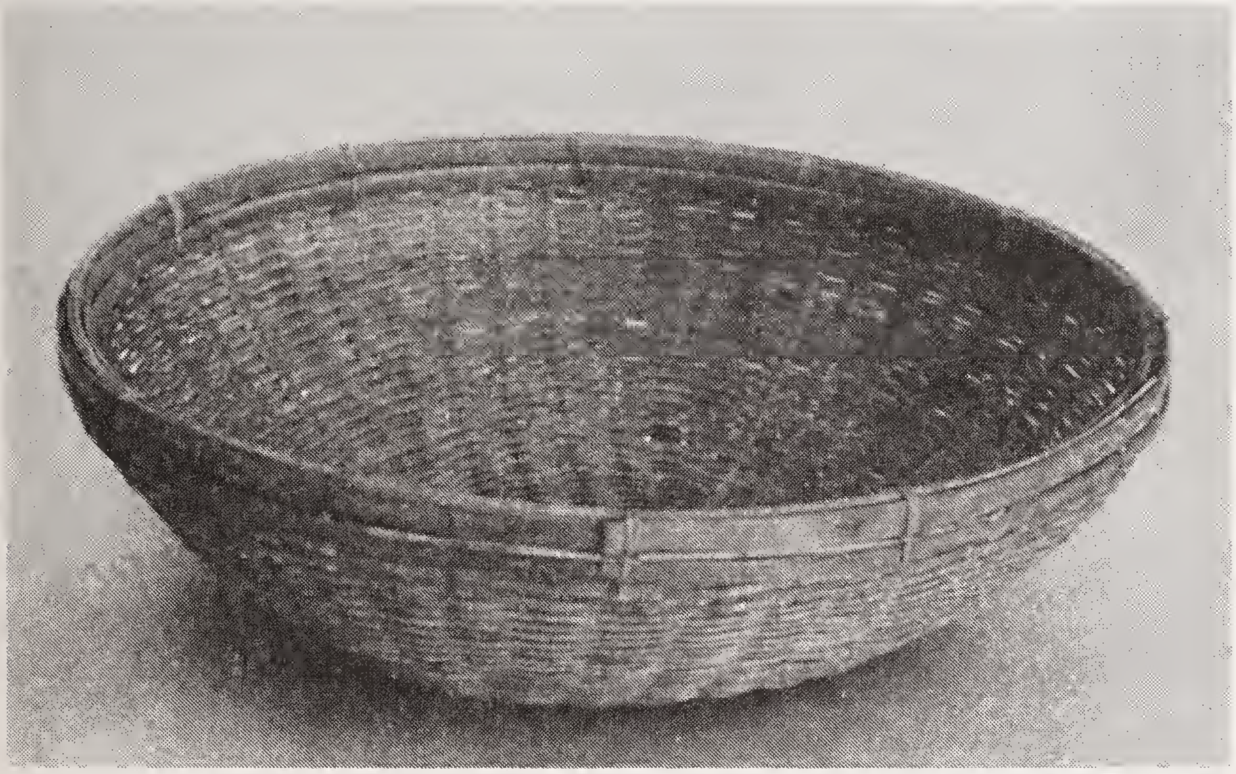
The diagonal of the base square measures 280 mm with the sides almost vertical to form a circular rim of diameter 250 mm. The height of the basket, excluding the soft fibrous handle fixed at the rim is 210 mm.

Rim

At the rim the edge of the woven surface is trimmed before it is strengthened by sandwiching between two rings made from wide splits of bamboo. The rough upper edge is covered by two rings made of small splits, each almost square in cross-section, before the whole rim assembly is bound firmly with split-cane binding (fig. 436).

Handle

The core of the handle is made from lengths of coarse cane inner splits (normally wasted) which are looped around the rim to points on opposite sides. This core is wrapped in wide strips of a very soft fibre, probably peeled from banana stem sheaths.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437: The *pasi*, a basket from Assam.

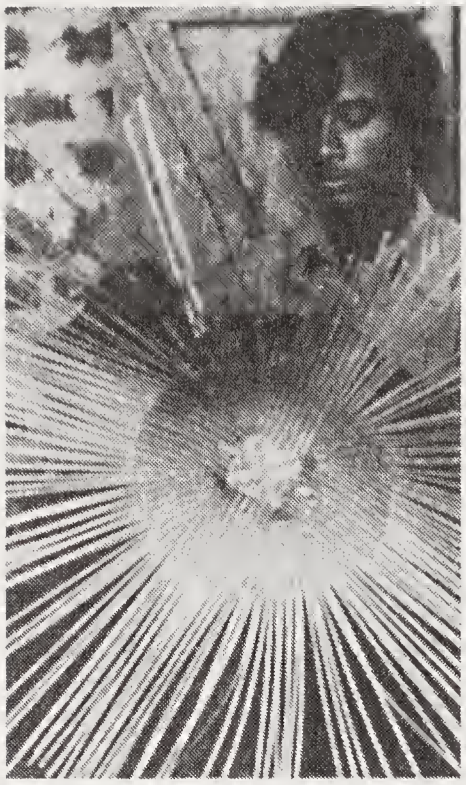
Pasi

The *pasi* is typical of the carrying baskets of Assam, especially from areas on the plains of the Brahmaputra River. The *pasi* and other baskets, similar in construction and form, are used for various purposes (figs. 437, 438). They are used for carrying various commodities, and are also found in the bazaar as a shop display container. These baskets are balanced on top of the head and larger sizes are suspended from shoulder beams. They are made in large quantities by specialised craftsmen and sold at bazaars in the towns of Assam (fig. 439).

Size and Shape

The basket is like a shallow circular bowl standing on a small square flat base. It is made entirely of split bamboo, with varying dimensions of splits used in different components. Split-cane binding is used only for the rim-strengthening elements. The diagonal of the base square measures 140 mm and the diameter of the circular rim is 500 mm. The height of the basket is 150 mm.

The splits used to form the warp are very wide but thin. These are on an average 16 mm wide and 1 mm in thickness, the total width of each warp element being formed by a pair of splits laid side by side. The weft elements are about one-fourth the width of the warp elements though their thickness is approximately the same.



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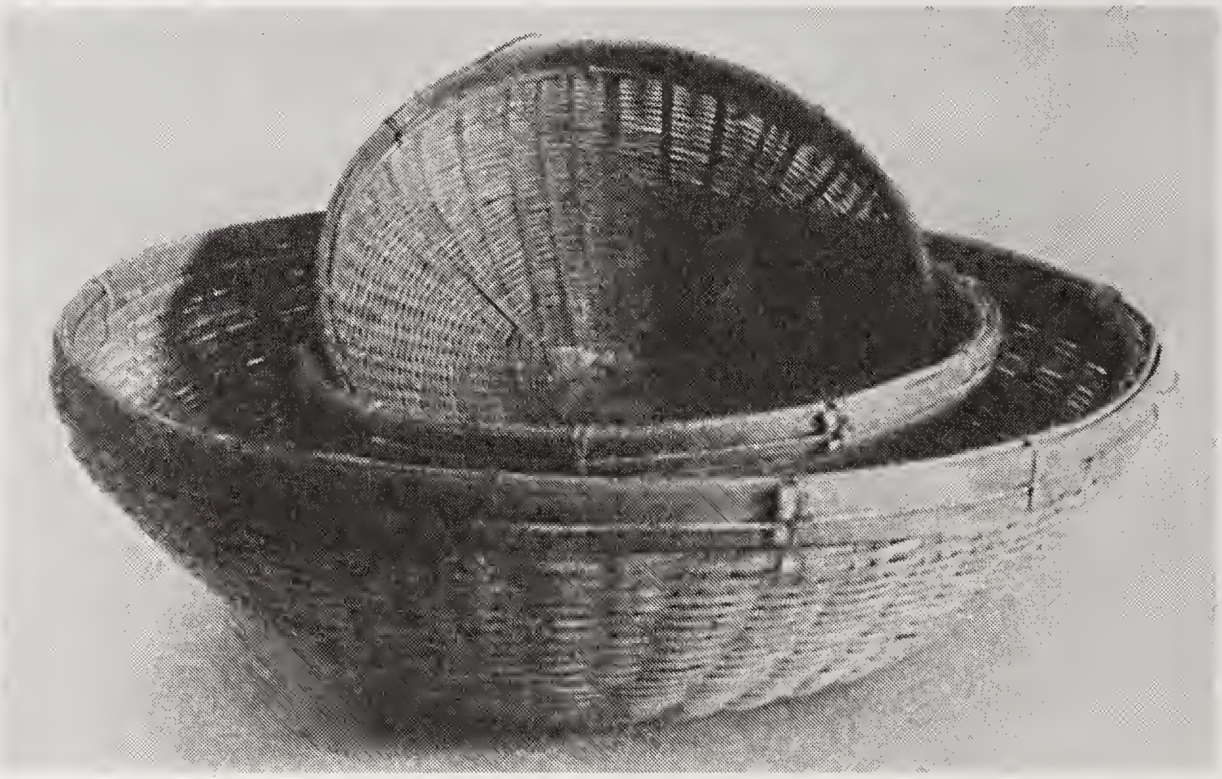
Weave Structure

Three sets of elements are used in the warp. The first forms the base square, elements of this set weaving in a mutually perpendicular orientation in a simple basket weave and the warp elements extend on all sides of the square up to the rim. The second set forms another layer below the first and these elements pass along the diagonals of the square base to extend up to the rim. The third warp set consists of individual wedge-shaped elements added into the side weave to fill the triangular gap, as required, between the first and second warp sets (fig. 440).

The weft is a single spiralling element, which at first passes around the perimeter of the square formed by the first warp set in a one-up-one-down structure. Here one of the warp elements extending outside the square splits



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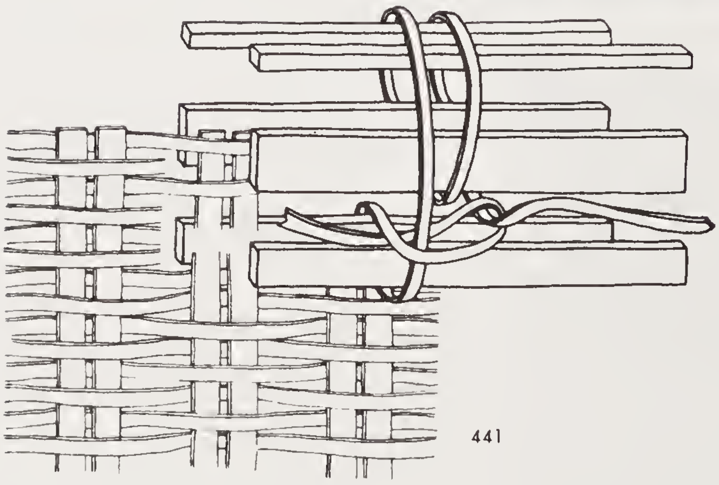

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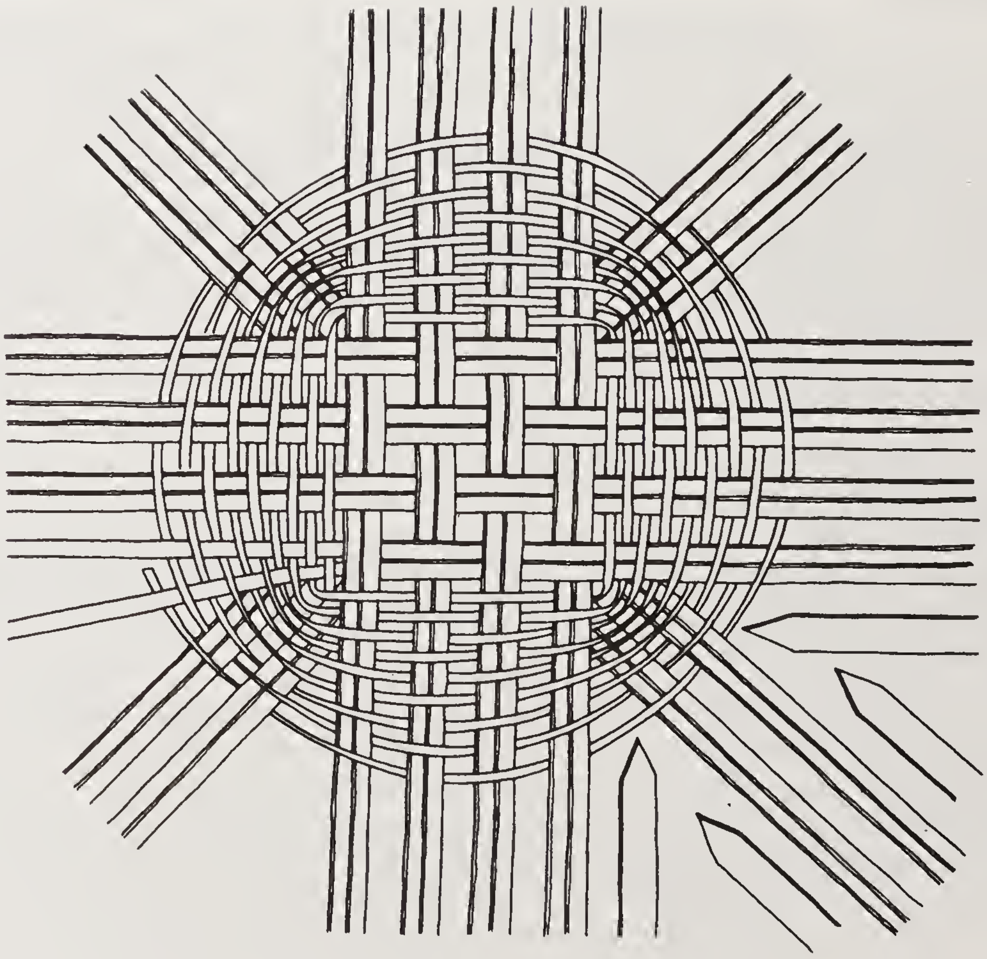


440

438: The *pasi*, the *mota korahi* and the *mahil korahi*.

439: A craftsman making the *pasi*.

440: The base of the *pasi* showing the wedge-shaped elements used to fill in the triangular gaps.

441: Detail of the rim binding.

up to form two warp elements, thereby creating the required odd number of warp elements. After a few turns of the spiralling weft, the warp elements of the second set are included in the weave, locking this set to the first. The elements of the third warp set are similarly held as the weft spiral progresses.

Rim and Other Details

The rim of the basket is strengthened by sandwiching the edge between two pairs of rings made of strong bamboo splits, pairs located one above the other and bound by split-cane binding (fig. 441). The base is strengthened by two thick bamboo splits inserted into the weave and forming the diagonals of the base square.

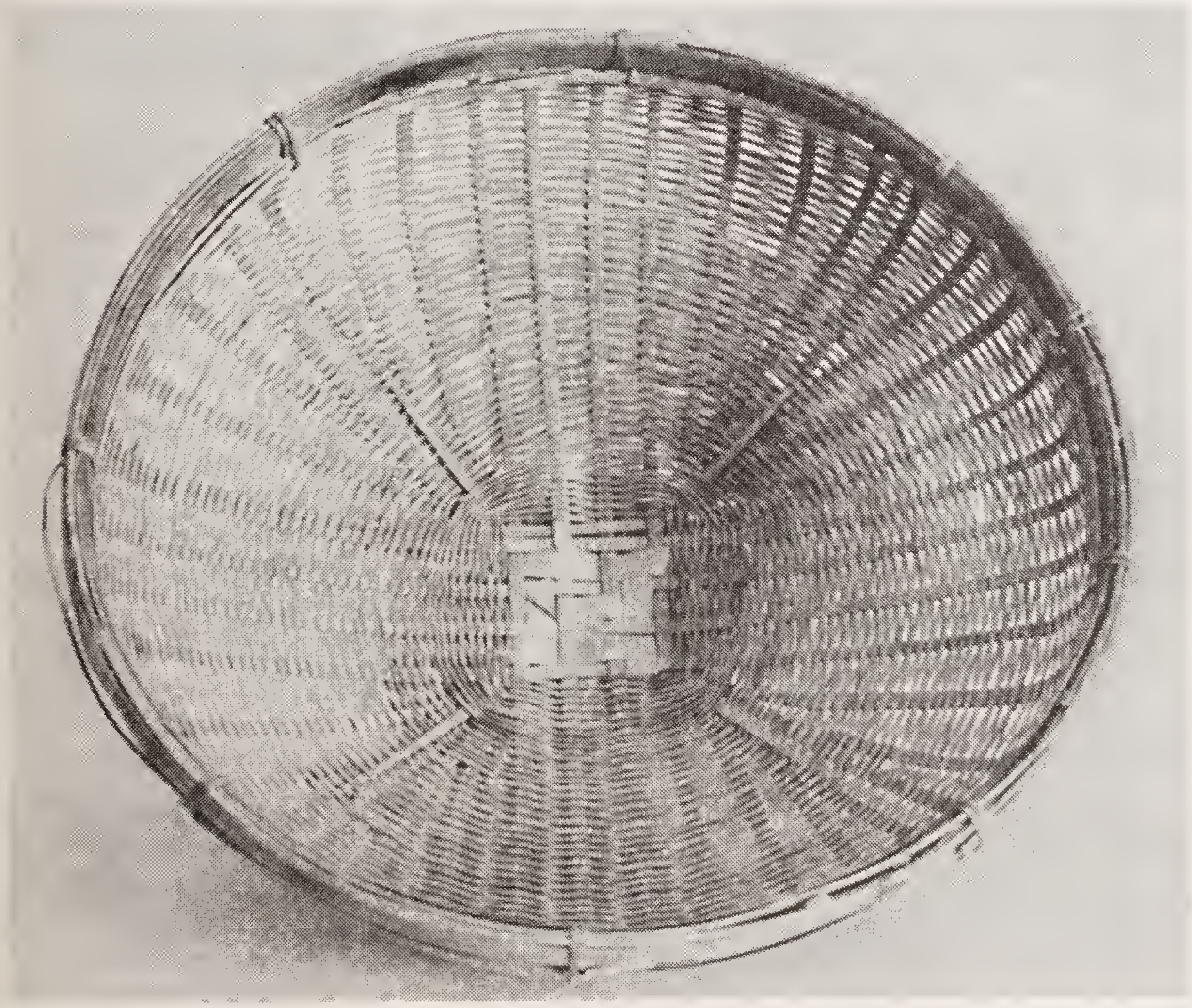
These baskets are made in several sizes to meet varying requirements. However, the construction system is maintained in all sizes though each given size of basket is identified by a different name.

Mota Korahi

The *mota korahi* is similar in construction to the *pasi* though smaller in size (fig. 442). The diagonal of the base square measures 80 mm and the diameter of the rim is 340 mm, while the height of the basket is 120 mm.

Mahil Korahi

The *mahil korahi* is smaller than the *mota korahi*. The major difference in construction is that bamboo outer splits are used for both warp and weft elements, hence a more refined surface finish is obained. The warp elements are individual splits, rather than pairs of splits. The individual warp elements are not as wide but their thickness in relation to width is greater. The weft element that spirals around the base square is made fairly narrow in width but is relatively thick. This results in a strong structure.



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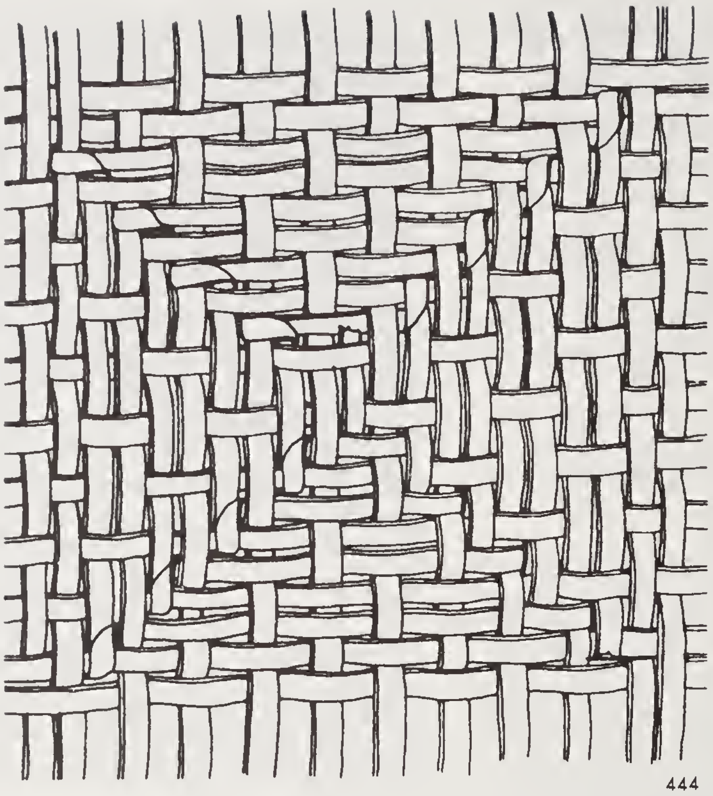
442: The *mota korahi* as seen from above.



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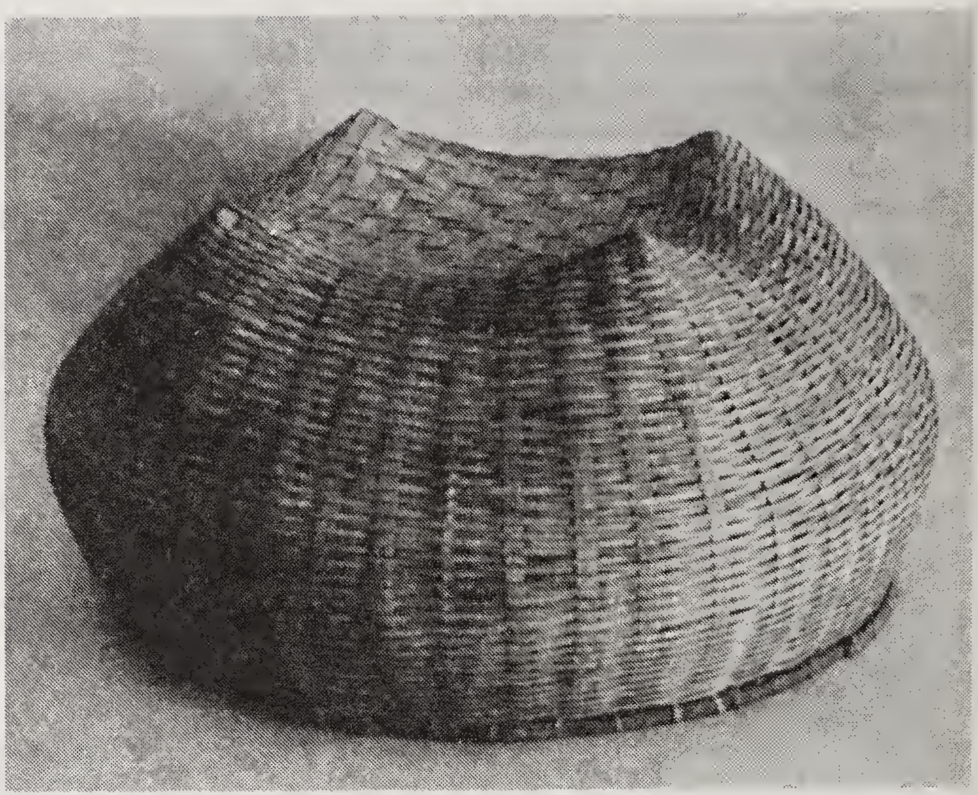


443

443: The *tukri* from Silchar resting on its rim showing the pronounced corners.

444: The base weave of the *tukri* showing the filler element.

Tukri from Silchar

The *tukri* is a shallow carrying basket made entirely of split bamboo. It has a characteristic form with the corners of the square base being quite pronounced. This is a Bengali product as a majority of the inhabitants of Cachar District are Bengalis (fig. 443).

Size and Shape

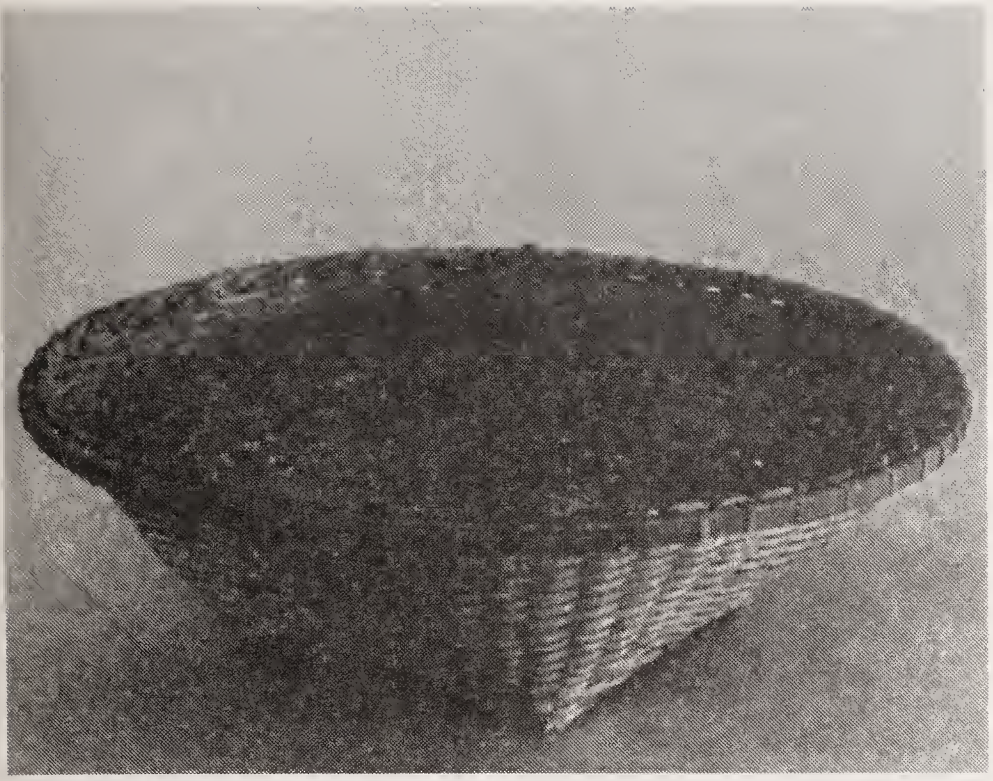
The basket has a square base which is held in tension, with the corners bent downwards to form a concave surface at the base. The sides of the basket flare outward for about half its height before narrowing down to a circular rim. This tensioning of the base square results in a complex curvature at the base and the basket rests on the pointed elongations created at the corners of the base. The diagonal of the base square measures 270 mm, the maximum diameter of the basket is 430 mm and the diameter at the rim is 390 mm. The height of the basket is 205 mm.

Base and Side Weave

Warp elements interlace in an open tabby weave to form the base square. These are bent up to form the stakes of the side weave. At the perimeter of the square base a pair of warp elements are closely spaced along each edge, while over the rest of the surface individual elements are spaced apart to leave gaps between elements. These open spaces in the base square are filled in by a continuous length of bamboo split which is wide and thin. The filling element starts from one edge of the square to spiral inwards towards the centre of the square base, always running parallel tc one side of the square, before folding around a warp element to move at right angles (fig. 444). This filling element also helps to tension the base surface. A pair of weft elements weave in and out of the warp alternately, and move upward as a two-start spiral. By varying the tension in these weft elements the shape of the basket is controlled.

Rim Strengthening

At the rim, the length of the warp elements extending above the last weft are bent sharply inwards, all inclined in the same direction before the rim is strengthened by a ring made of thick bamboo split. This ring is attached to the warp elements, using split-bamboo binding. Each warp element is crushed and twisted into several smaller splits before being bent at the top.



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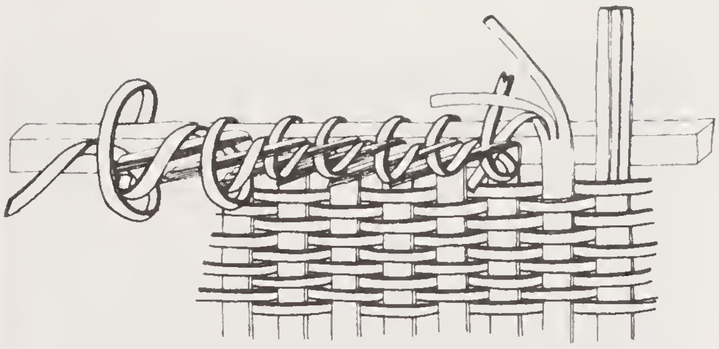


446

445: The *tukri* from Tripura.

446: Detail of the rim binding as seen from inside.

Tukri from Agartala

The *tukri* is a shallow basket used by the Bengali settlers of Tripura. The form of this basket is distinctly different from the one used in Cachar District of Assam (fig. 445).

Size and Shape

The basket has a square base, and the sides flare out sharply to a large circular rim. The corners of the square are not as pointed as in the Silchar basket and the base square remains quite flat. However, the rim-strengthening detail is identical (fig. 446). The *tukri* from Agartala has a rim diameter of 390 mm and the diagonal of the base square measures 220 mm. The height of this basket is 150 mm.

Structure and Construction

The base square is formed by interweaving wide but thin warp elements in a twill structure that has a four-fold symmetry around the centre of the base. No gap is left between warp elements at the base, but as they move up the sides the gaps between consecutive warp elements are increased.

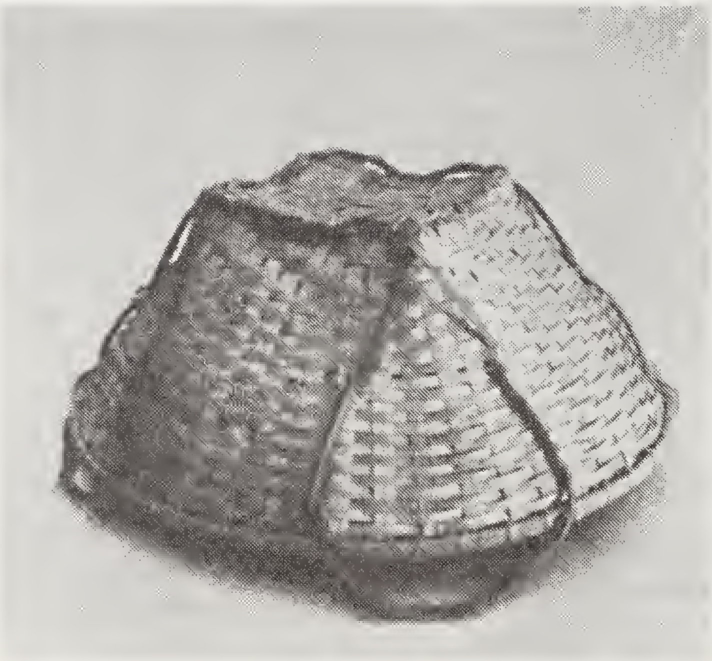
The weft uses bamboo splits about one-third the width of the warp, the thickness being almost the same. A pair of weft elements weave into the warp extending out of the base square to move as a double-start spiral. Near the base a two-up-two-down twill structure is maintained for a few turns of the spiralling weft. Above this all the way to the rim, there is a one-up-one-down tabby structure, with alternate rows passing above and below a given warp element.

Karawala tukri

The *karawala tukri* is a Tripura Bengali product. It is identical in construction to the *tukri* of Agartala with the exception that four strong handles are attached to this basket. The *karawala tukri* is used for carrying construction materials, such as earth for road building (figs. 447, 448).

Size and Shape

This basket is made from split bamboo, while the handles are of split cane. It has a squre base of diagonal 210 mm and the sides flare up sharply to a circular rim of diameter 425 mm. The height of the basket, excluding handles, is 170 mm.



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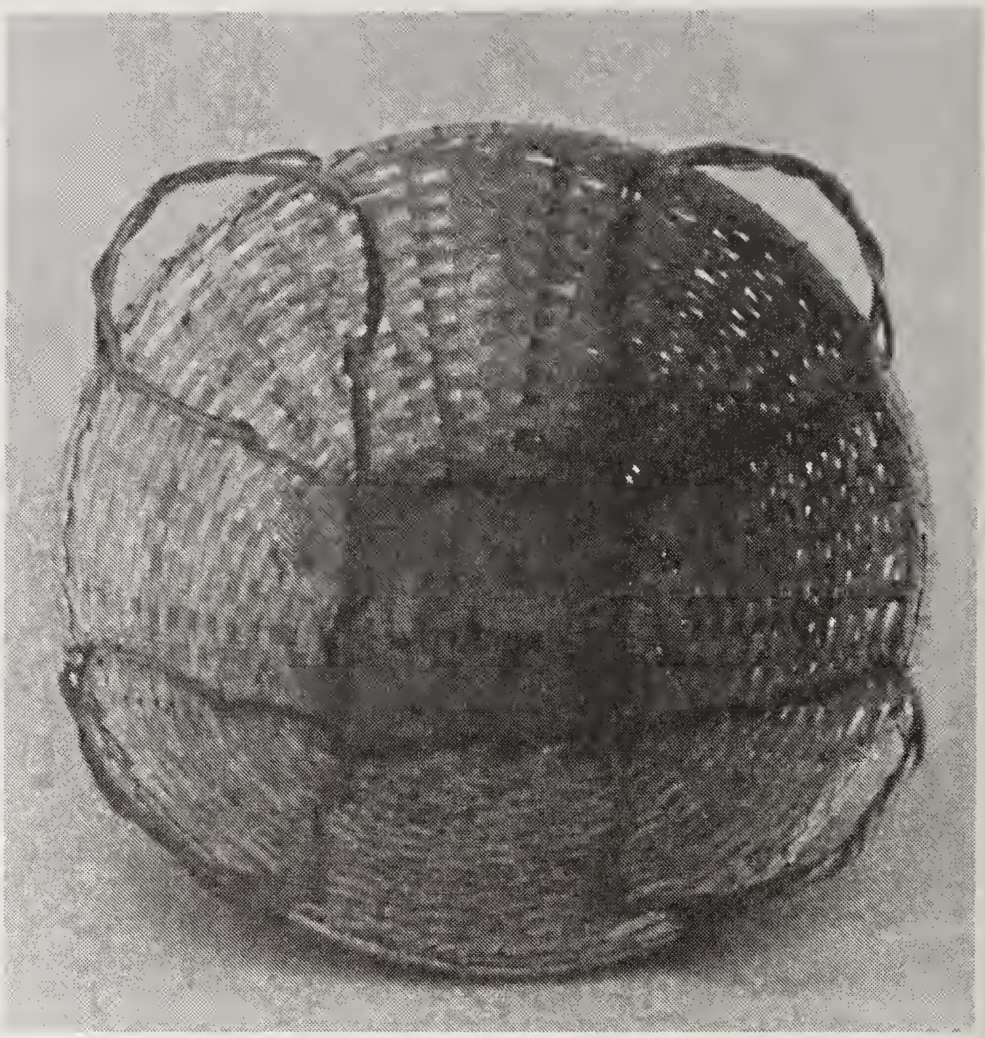


447

447: The *karawala tukri* from Tripura as seen from above.

448: The *karawala tukri* resting on its rim.

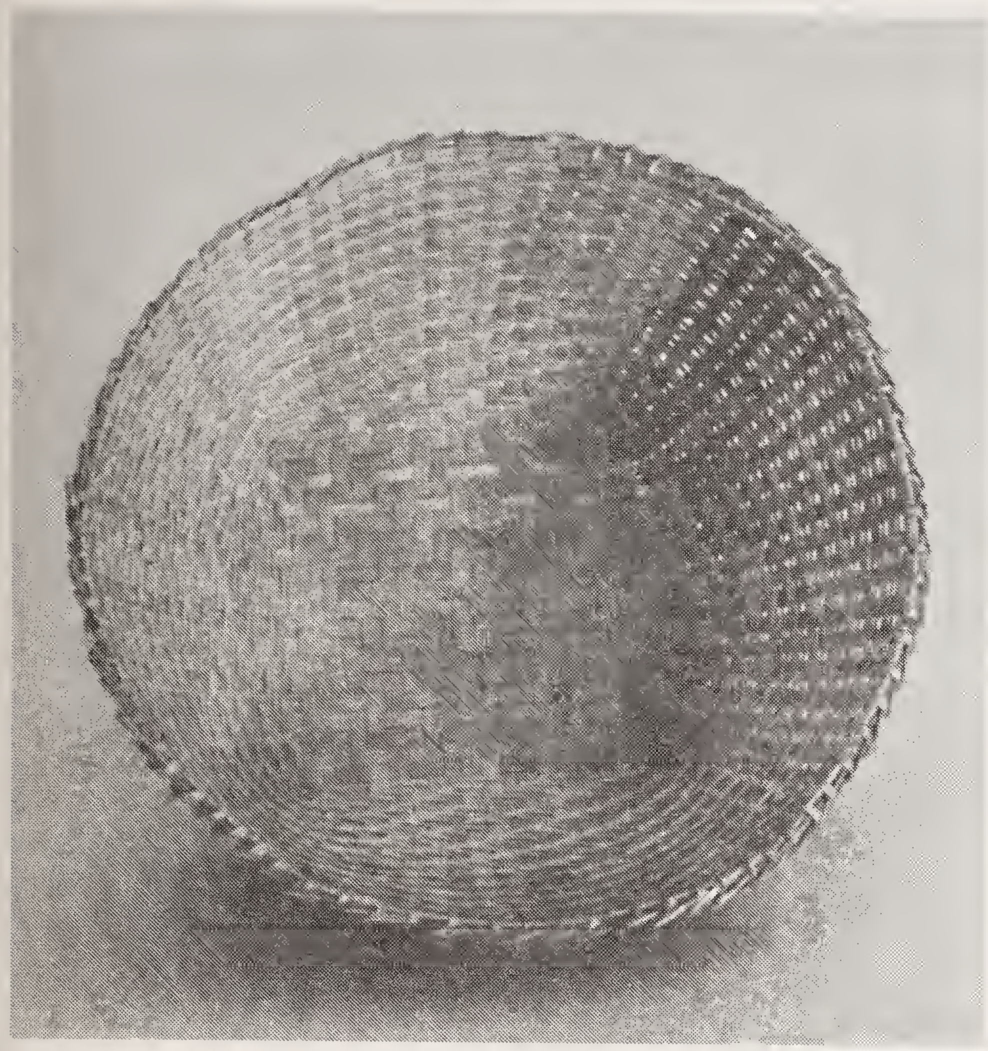
Handles

The handles, called *kara*, are made in an interesting construction using a pair of stout cane splits. Each is located above the rim, oriented along the diagonals of the base square. A pair of cane splits are twisted together to form the grip and both ends of each handle are anchored firmly to the basket. The pair of splits pass on either sides of the strengthened rim to continue down the side of the basket, stitching in and out of the side weave. In the process, these splits strengthen the side weave. The splits from either side of each handle meet at the respective corners of the base square before continuing around the perimeter of the base and strengthening this part too. Hence, the load in the basket is effectively transferred along the lengths of split cane, strengthening the sides and forming the handle. Further, as these splits pass on either surface of the basket, both at the sides and the base, they protect the split bamboo weave structure from damage by preventing abrasive contact with the ground as well as the materials carried.

Laii

The *laii* is a small bamboo basket used by Tripura Bengalis for washing rice (figs. 449, 450). It has a square base of diagonal 220 mm and the sides flare outwards to a circular rim of diameter 320 mm. The height of this basket is 140 mm. Two sets of warp elements, made from wide splits of bamboo, interlace to form the base square. The weft is a double-start spiral interlacing the warp in a two-up-two-down twill structure (fig. 451). The rim is strengthened by a single ring of split bamboo bound to the inside surface of the side weave by split-cane binding (fig. 452).

Several variations of shape and size can be seen among the baskets generally called *tukri* ("basket" in Bengali). Some have twisted cane handles attached to facilitate carrying (fig. 453).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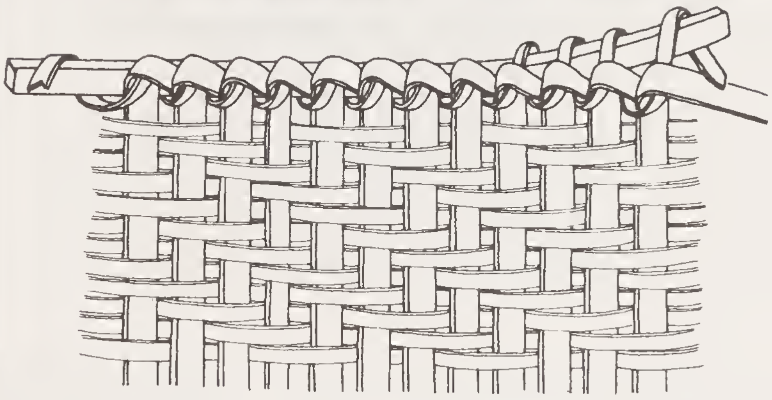
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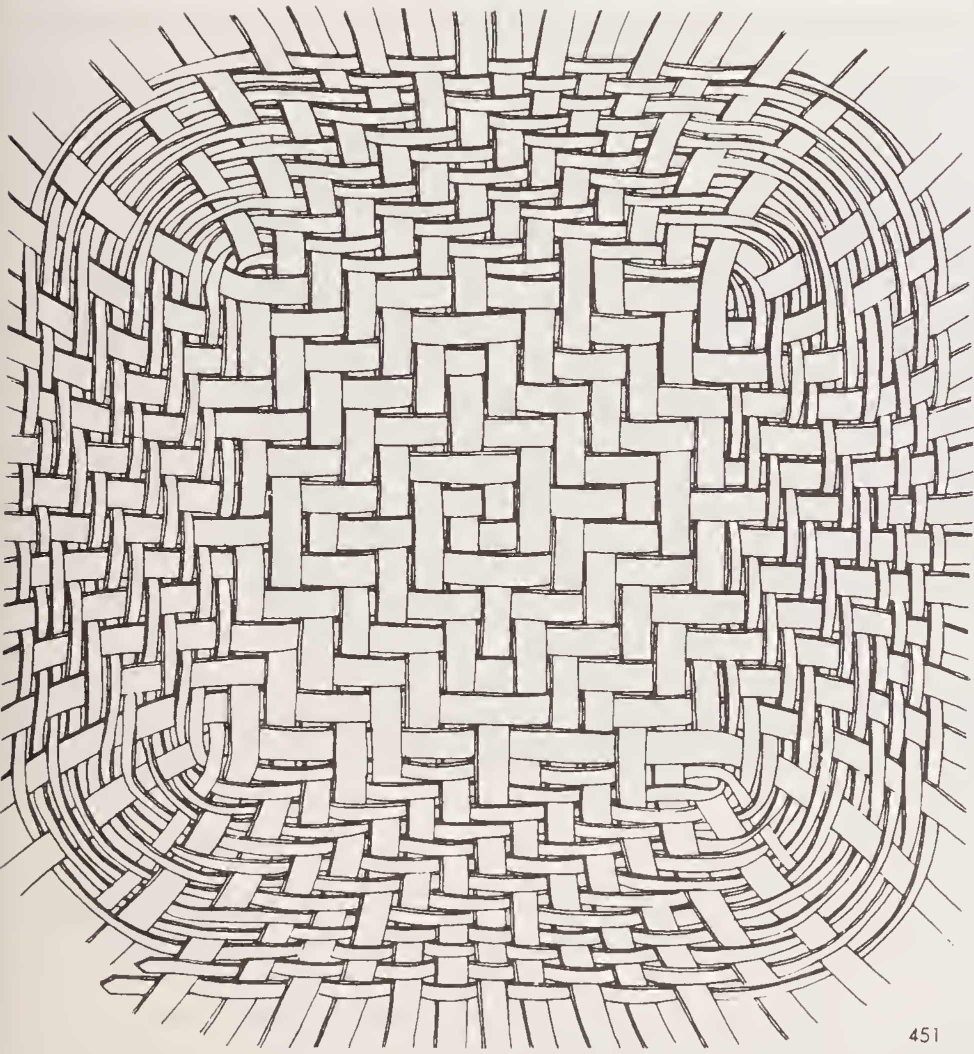
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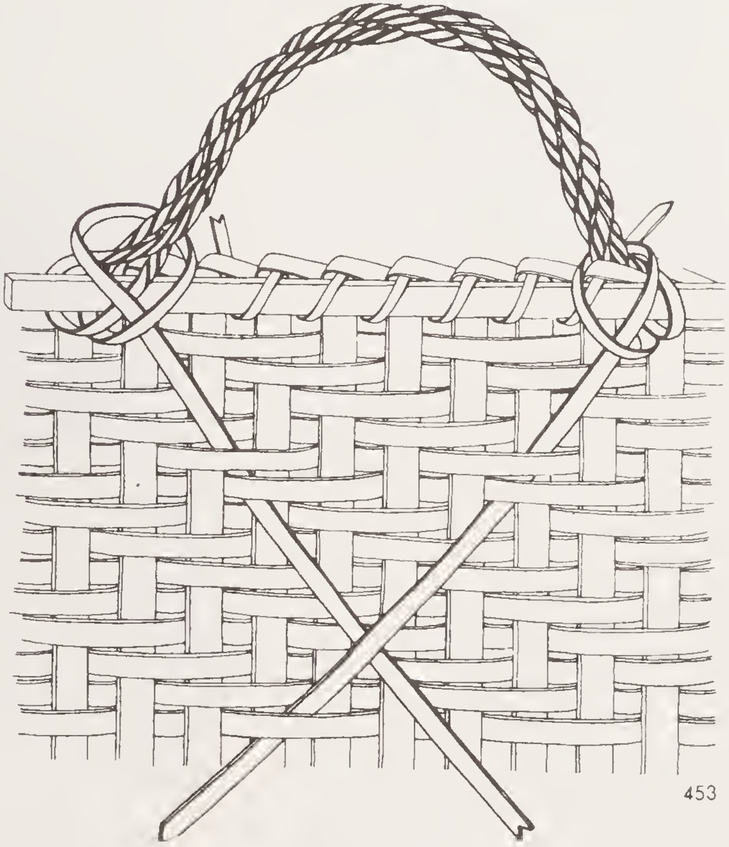

453

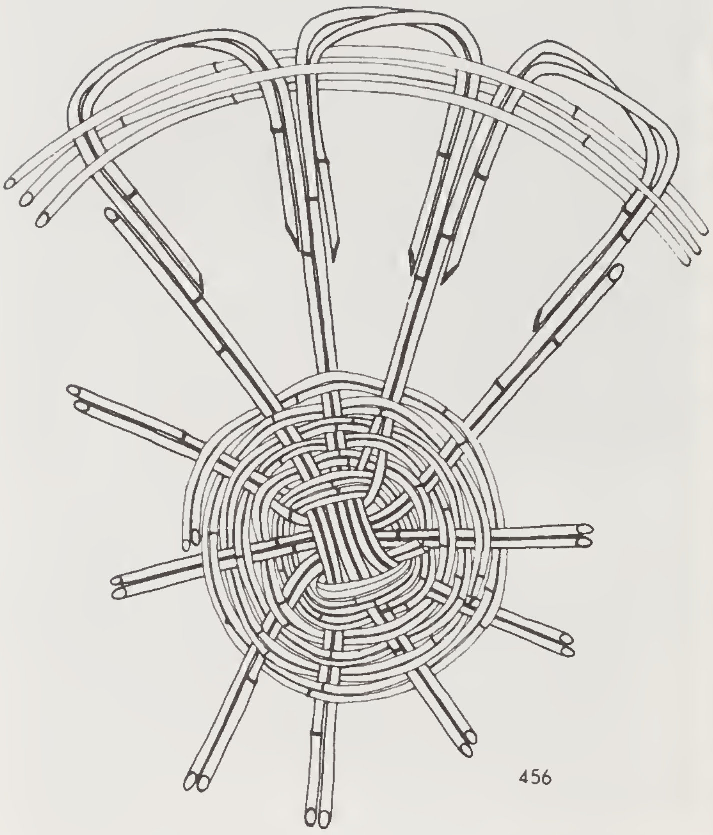
449: The *laii*, used by the Tripura Bengalis for washing rice.

450: The *laii* as seen from above.

451: Detail of the base and the beginning of the side weave of the *laii*.

452: Detail of the rim binding.

453: The handle construction and rim binding of a variation of the *laii*.



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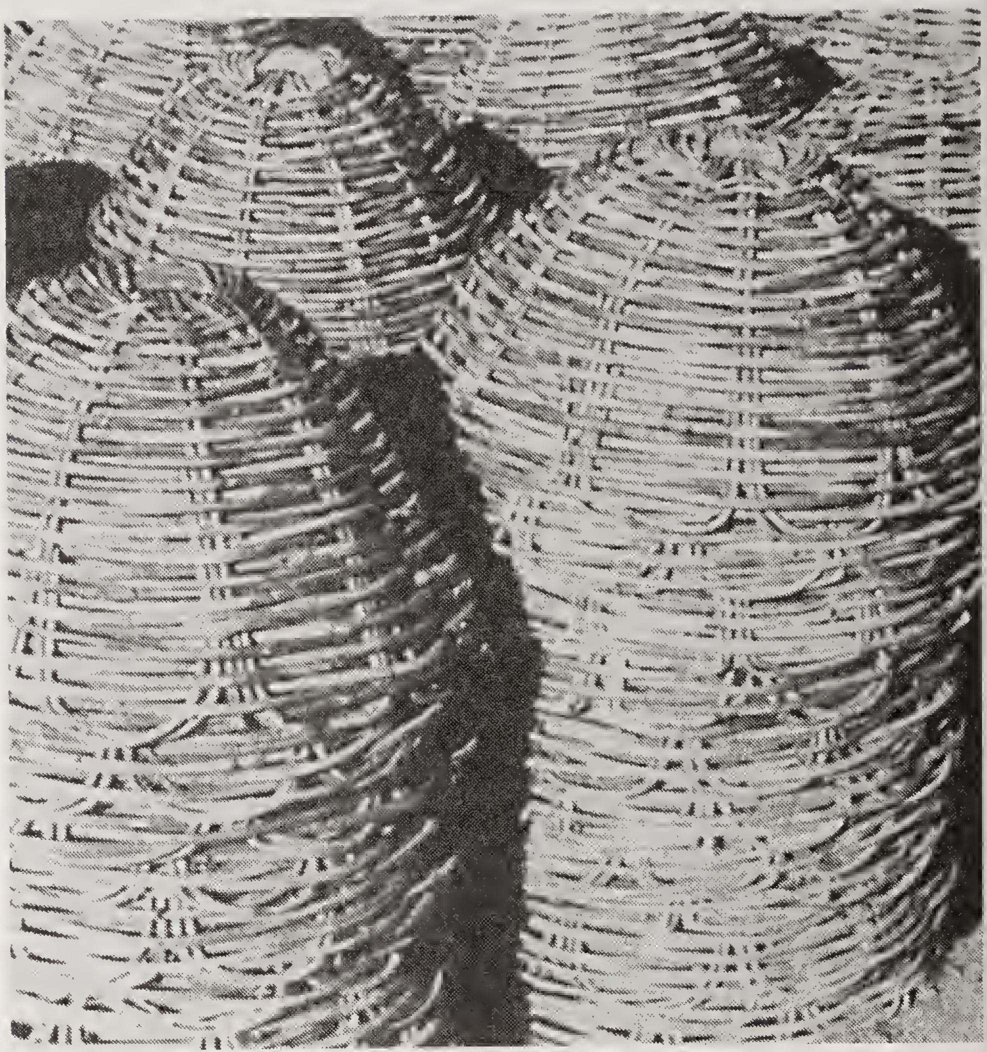
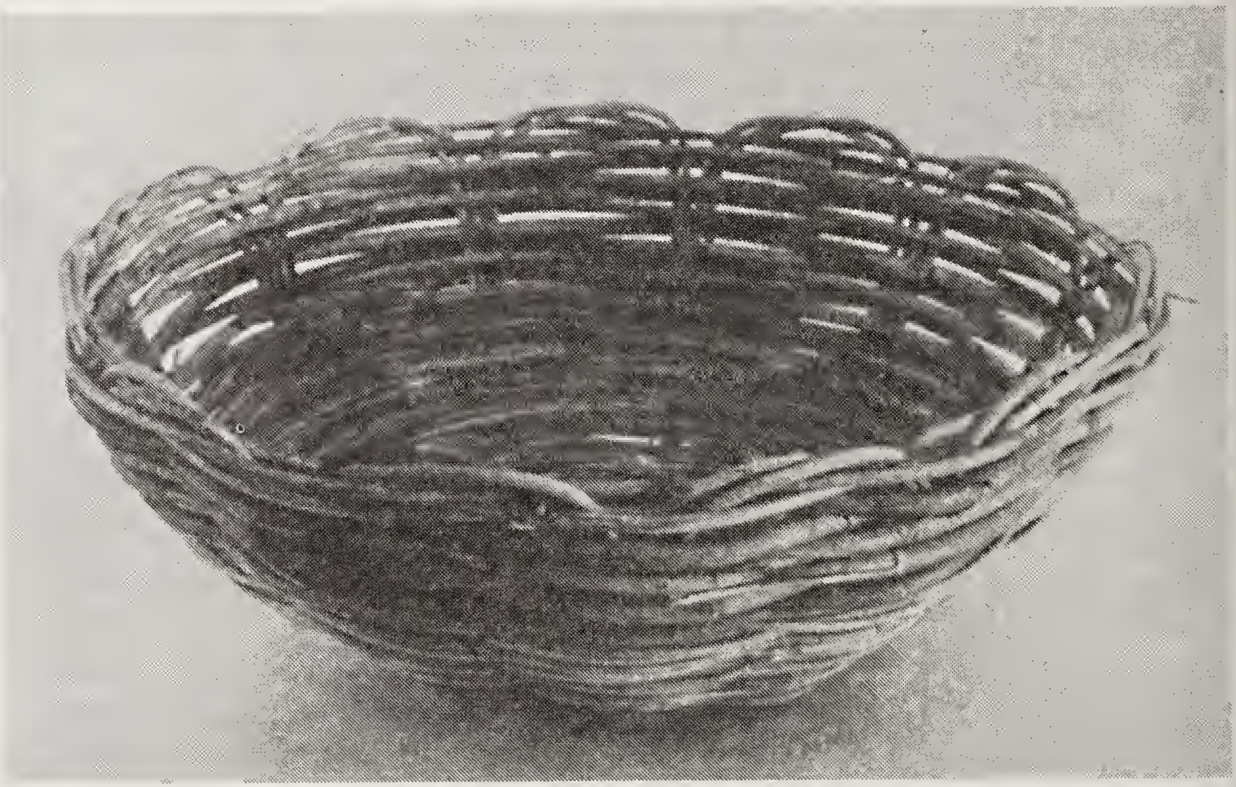


455

454: The whole cane basket used extensively by the railways, collieries and construction workers.

455: The highly stackable basket makes transport economical.

456: A flattened view of the base and rim of the basket.



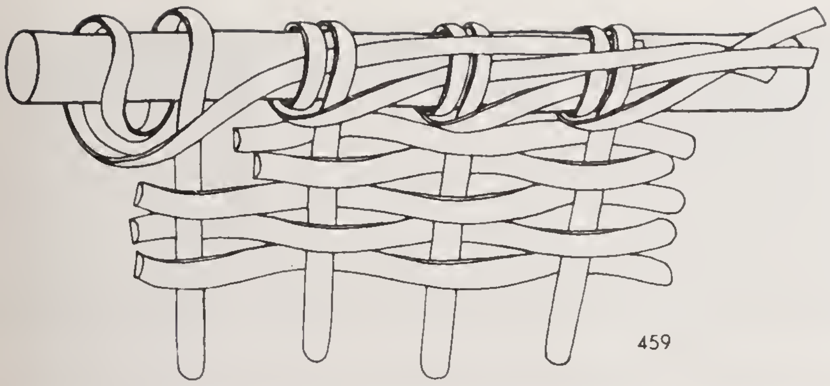
454

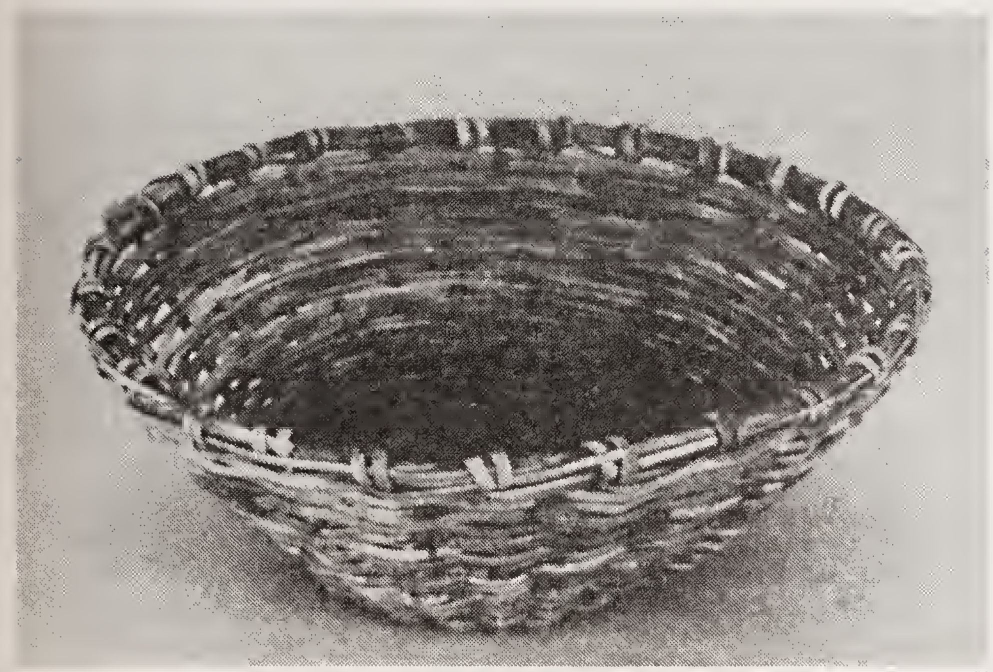
Whole-cane Basket

The whole-cane basket used extensively by the railways and collieries to transport coal is a semi-spherical container balanced on top of the head (fig. 454). These are being made in large quantities by contractors in Assam for upcountry delivery, as cane is available at a relatively low price (fig. 455). Made in two standard sizes, one large enough to hold an optimum head-load and the other a much larger one, the baskets are fitted with a metal hook detail to facilitate lifting by a mechanical winch.

Size and Structure

As the name suggests, the basket is woven entirely from whole cane elements. It has a rim diameter of 470 mm and a height of 200 mm.





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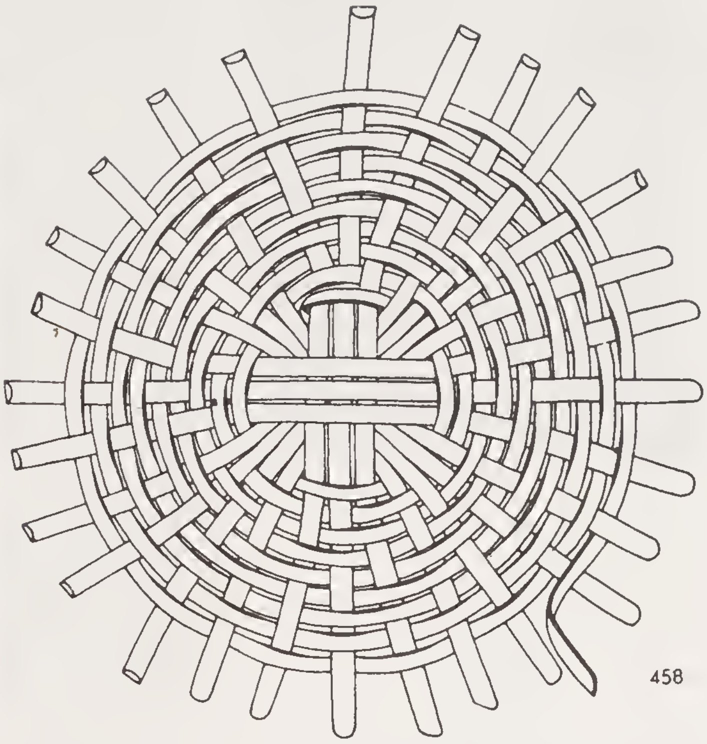


457: A cane basket from Gohpur in Assam.

458: Detail of the base.

459: Detail of the rim binding.

The base of the basket is formed when two sets of warp elements are laid, one over the other and at right angles to each other, and a weft element, consisting of three or four thin whole-cane members taken together, are wound over and under the sets, spiralling around the centre. After the warp is held in place in a firm centre, pairs of warp members separate from the sets to radiate up the sides while the weft continues as a spiral, passing over and under consecutive warp elements. Near the rim, single whole-cane members of a bigger cross-section are used in the weft, instead of a bunch of thin elements (fig. 456).

The rim of the basket is finished by the warp elements being bent around the edge, to be tucked back into the weave near an adjacent warp element. As each warp element is formed by a pair of whole-cane elements, these separate and are bent in either direction before being tucked back into the side weave. The construction results in an extremely tough and sturdy basket that can withstand extremely rough use; hence its demand.

Cane Basket from Gohpur

The cane basket from Gohpur in Assam is used for carrying construction materials (fig. 457). It has a small circular base and the sides move outwards to a large circular rim. The diameter of the base circle is 200 mm and the rim diameter is 340 mm. The height of the basket is 170 mm.

Structure and Construction

Both warp and weft elements use half-cane splits. The warp elements are arranged radially across the centre of the base and spread out as they move up the sides of the basket. The weft is a spiralling element that weaves in a two-up-two-down structure in the base, to continue up the side in a simple tabby structure (fig. 458). The rim is strengthened by a ring made from thick whole cane, held to the woven side by the extra length of the warp elements. These are looped around the strengthening element before running parallel to the rim, each being held against the strengthening element by loops formed by subsequent warp elements (fig. 459). This basket is not as strong as the whole-cane basket.

461

460: The *thumok*, a basket from Manipur.

461: A Manipuri woman carrying a *thumok*.

462: The *thumok* resting on its rim.

463: A flattened view of the base and part of the side weave of the *thumok*.

464: The movement of the cane split used for the corner binding.

465: Detail of the binding at the corners of the base.

466: A variation of the corner binding used in smaller baskets.

467: Detail of the rim binding.

Thumok

The *thumok* is a general-purpose carrying basket used by the Manipuris of Imphal Valley (fig. 460). It is used to carry a wide range of commodities and it also serves as a storage and display container in bazaar shops. The basket is balanced on top of the head (fig. 461).

Shape and Construction

The basket has a large square base and the sides curve outward to a large circular rim. Made in several sizes, the smaller ones are used primarily for storage. Some variations in shape may be seen, where the base is rectangular with the sides leading to an elliptical rim. However, the construction of these baskets remains the same. The *thumok* is woven from split bamboo, and split cane is used in the rim-strengthening detail as well as in an interesting corner-strengthening binding detail at the base (fig. 462).

Size

Three samples of this type were acquired, two of them square-based, woven in two sizes and the third a small rectangular-based basket. The large square-based *thumok* has a base square of diagonal 360 mm, and rim diameter 420 mm. Its height is 210 mm. The small square-based basket has a base square diagonal measuring 240 mm, rim diameter of 250 mm and its height is 135 mm. The small rectangular-based basket has a base rectangle measuring 180 mm by 115 mm, an elliptical rim of major axis 245 mm and minor axis 215 mm. Its height is 190 mm.

Base and Side Weave

The base is formed by the wide warp elements weaving in a closely-packed twill weave with a four-fold symmetry around the centre of the base (fig. 463). Two elements that bisect the square base are at first overlapped to form the centre of the base. Pairs of elements are added parallel to and on either side of the first bisecting element before a second pair is added on either side of the second bisecting element. Hence, the base is built up from the centre outwards towards each side of the square. Near the base, wide weft elements spiral around the base square in a three-up-three-down twill and after a certain height thinner weft elements are used to generate a different texture.

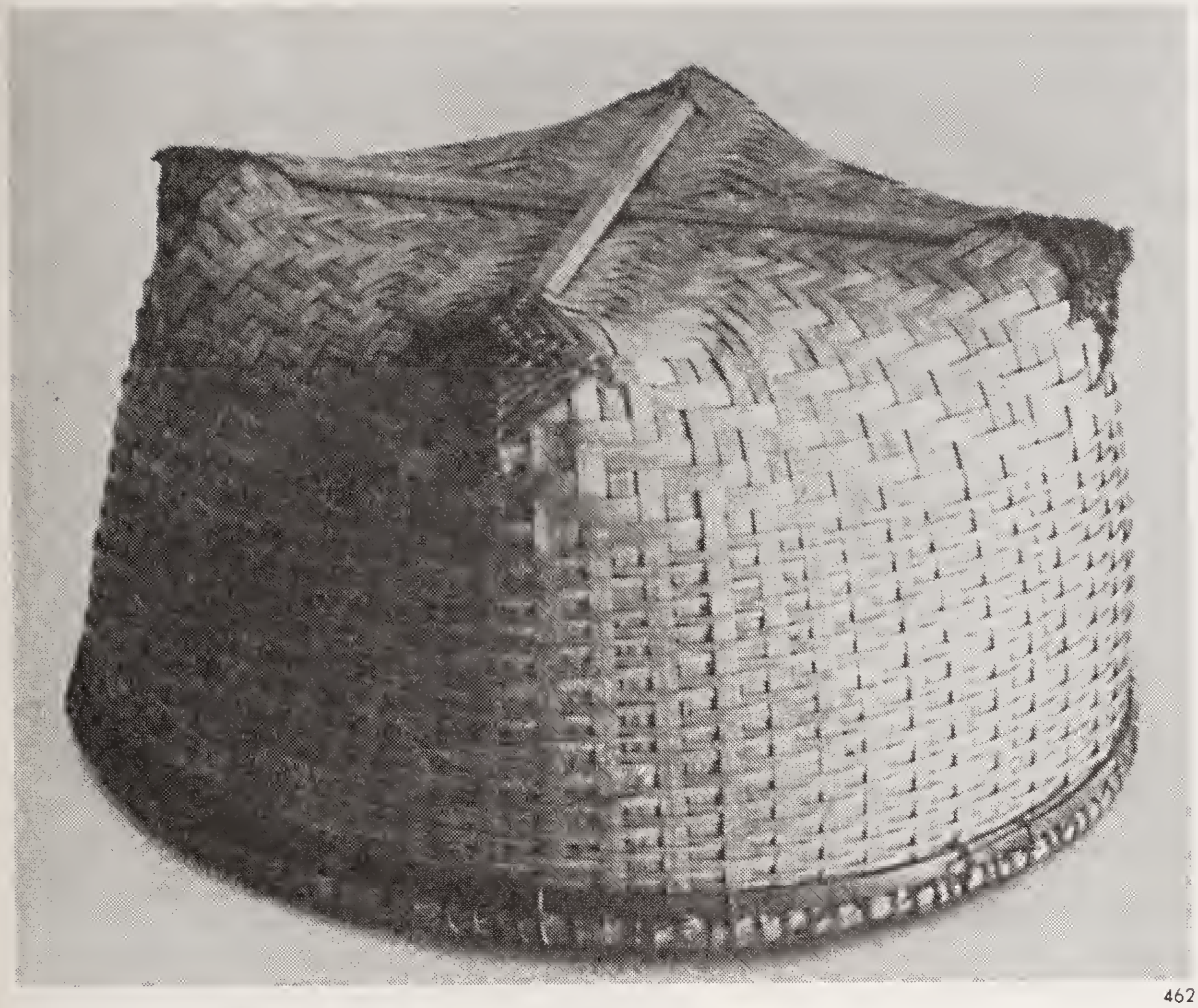
Base and Corner Strengthening

The base is strengthened by thick bamboo splits inserted into the weave at the bottom of the basket and these form the diagonals of the base square. The corners of the basket are strengthened by split-cane binding elements forming square based pyramids which are superimposed and bound to each corner of the basket.

This knotting detail has a highly decorative quality (figs. 464, 465). In the two smaller baskets this detail is in the form of a triangular-based pyramid, the construction being similar (fig. 466).

Rim

At the rim the warp elements are bent and twisted to form a thick ring of circular cross-section with each warp element moving a short distance along this ring forming a helix. The side weave just below this ring is sandwiched between two rings of wide cane-split and a thin binding element that is wrapped around the upper rim also binds the sandwiching, strengthening elements intermittently (fig. 467).



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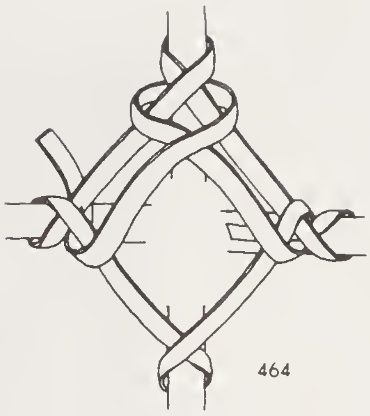

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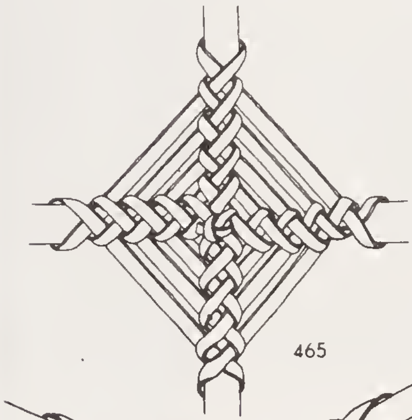

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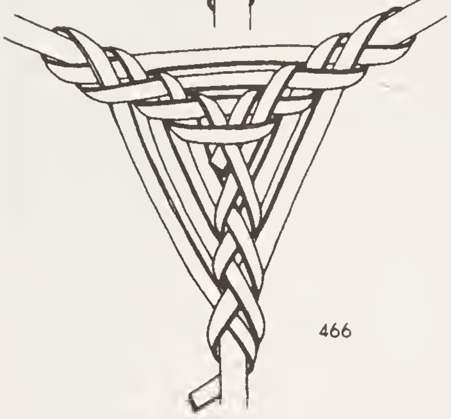

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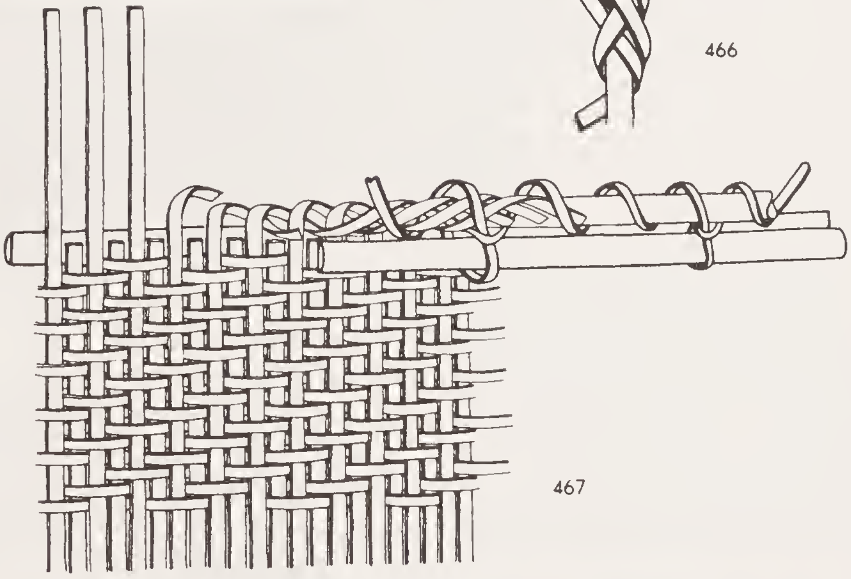

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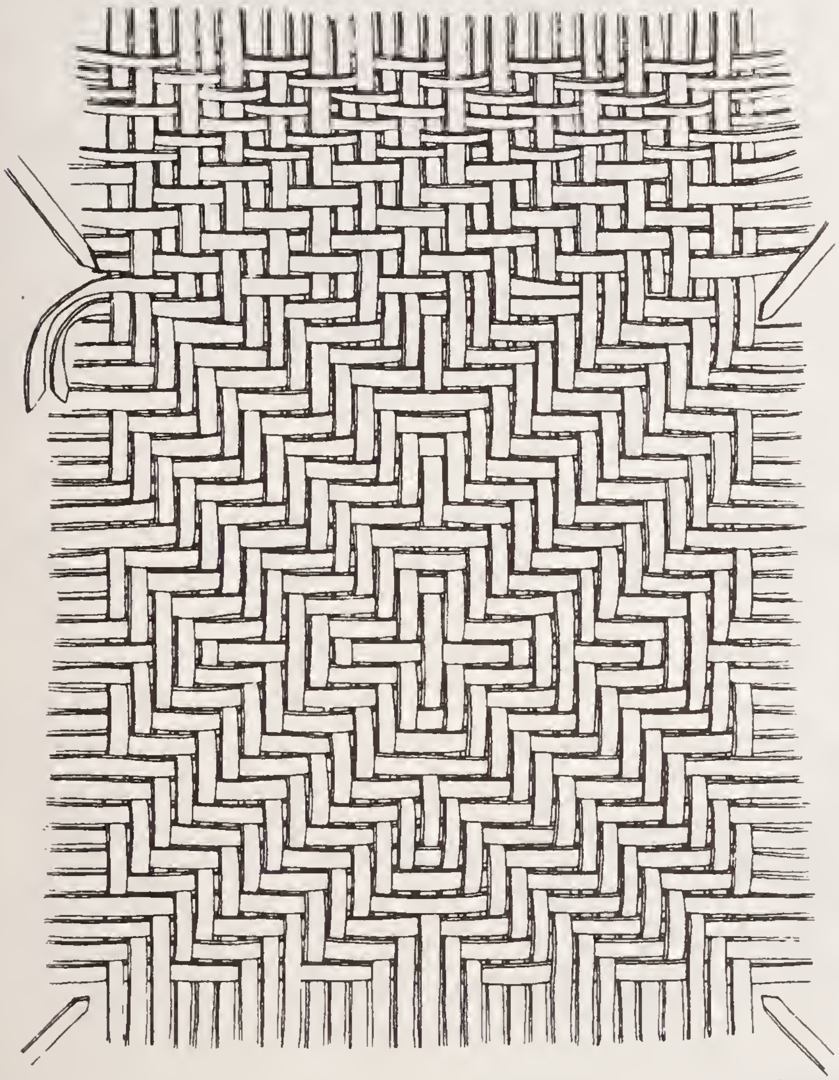

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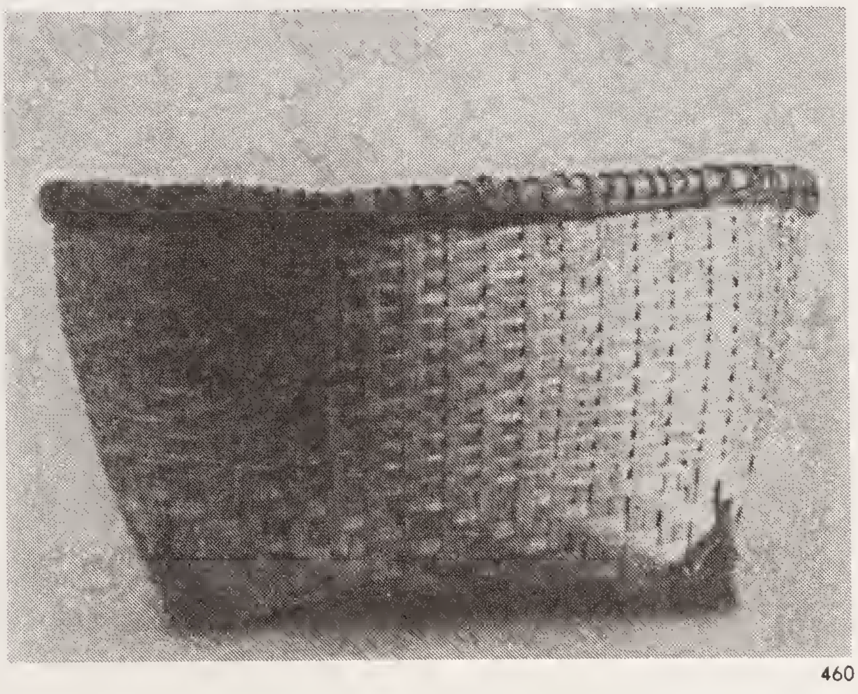


460

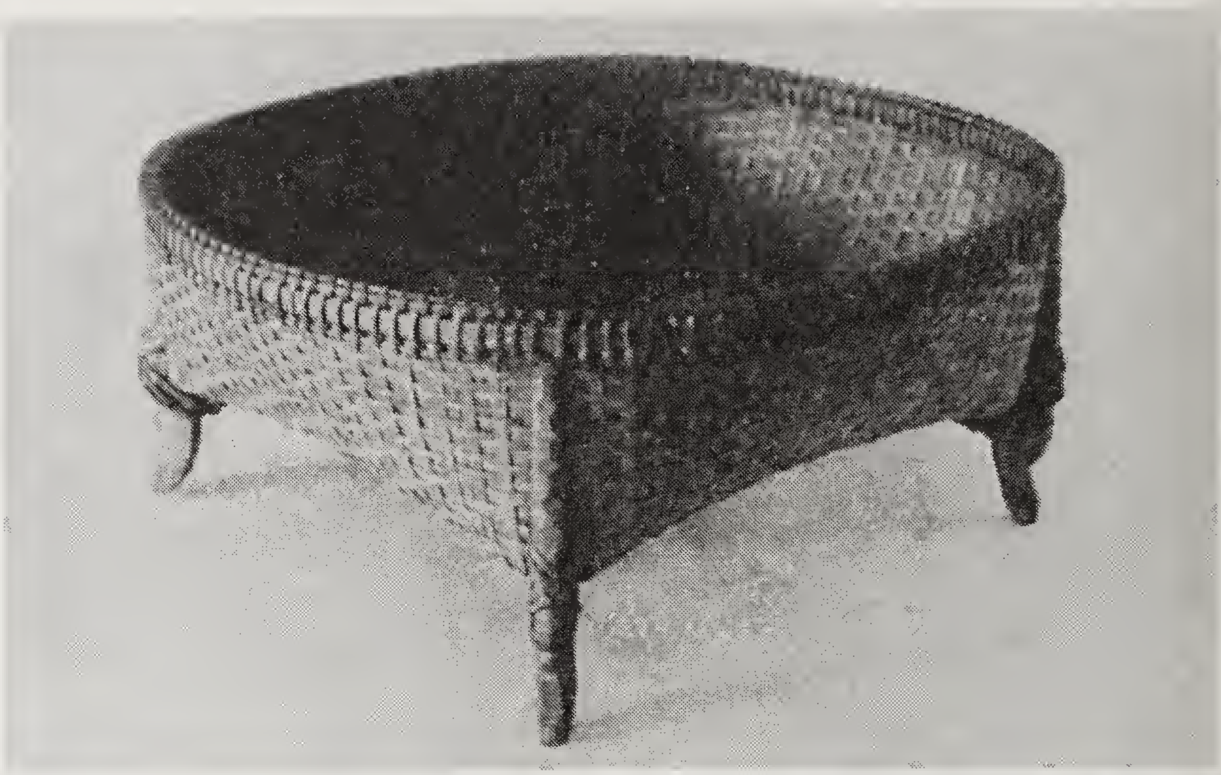
468: The *shairuk*, a basket from Manipur.

469: The *shairuk* resting on its rim.

470: The leg element is shaped from a thick bamboo splint.

471: Detail of the rim binding.

472: The *chengamuk*, used by the Manipuris to wash rice.



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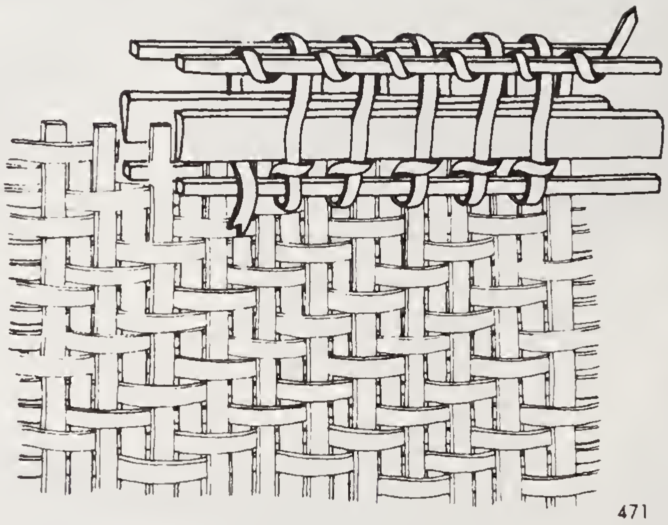

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472

Shairuk

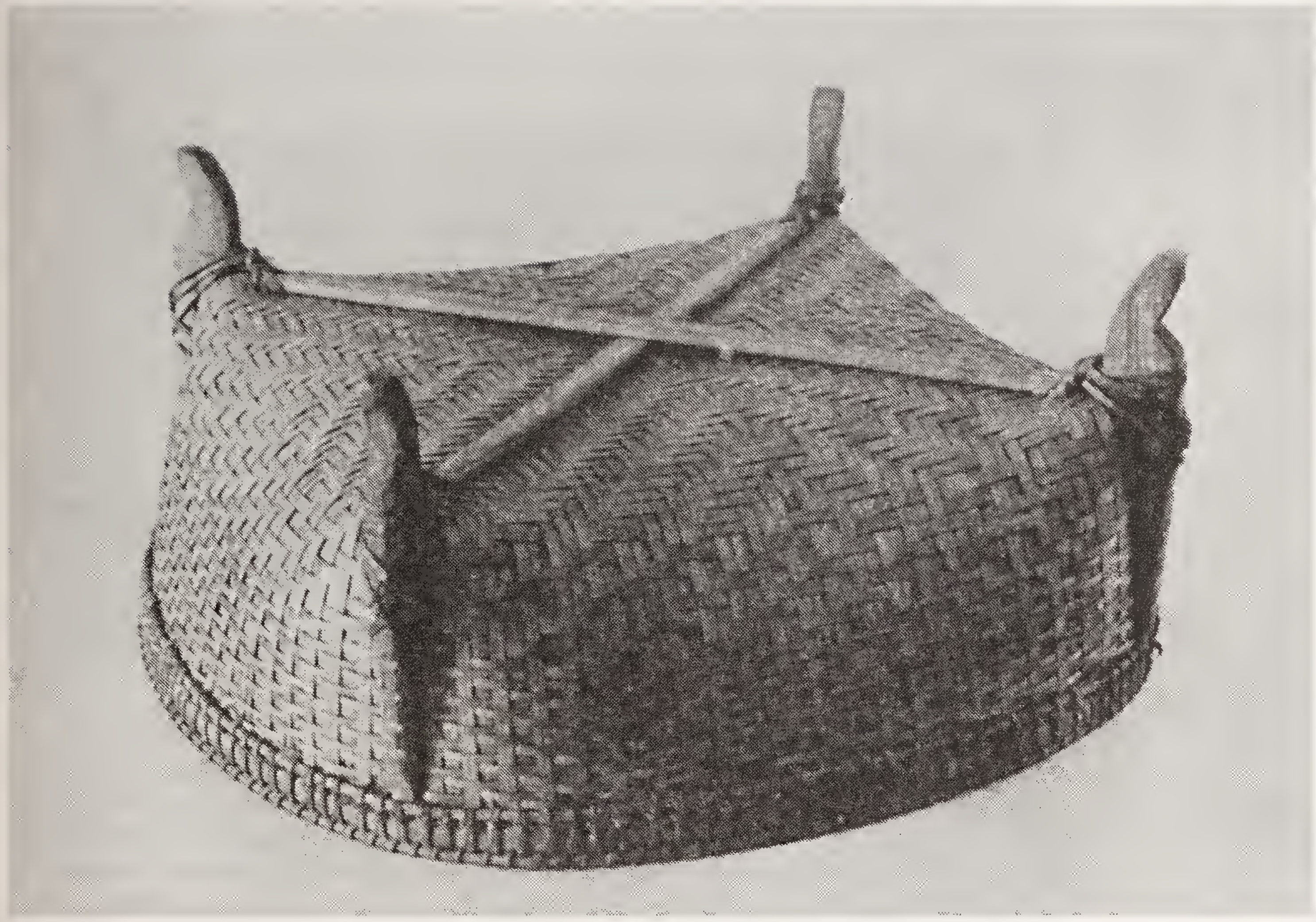
The *shairuk* is a shallow bamboo basket used by the Manipuris of Imphal Valley, both as a carrying basket and as a storage and shop display container (fig. 468).

Size and Shape

This basket, woven from bamboo splits, has a square base with the sides almost vertical at the corners. The rim is square-shaped with generous corner and side radii, though not quite circular. The diagonal of the square base measures 400 mm, the diagonal of the rim is 420 mm, while the height of the basket including the legs is 180 mm. The legs extend 60 mm below the base of the basket (fig. 469). The base and sides of the basket are woven like the *thumok*, but the main difference lies in the leg detailing and the rim-binding detail.

Legs and Base Strengthening

The legs are carved and shaped from bamboo elements of a large rectangular cross-section. Before shaping, the rectangular cross-section of the



469

bamboo split measures 30 mm by 15 mm. Hence this split is taken from a bamboo culm of large diameter and wall thickness (fig. 470). The shaped leg is bound to the basket at each corner with a split-cane binding locking into the side and base weaves at several points. The upper end of the leg element is inserted into the rim, so as to strengthen the side as well as corner of the base. The base is as usual strengthened by thick splits of bamboo inserted into the base weave to form the diagonals of the base square.

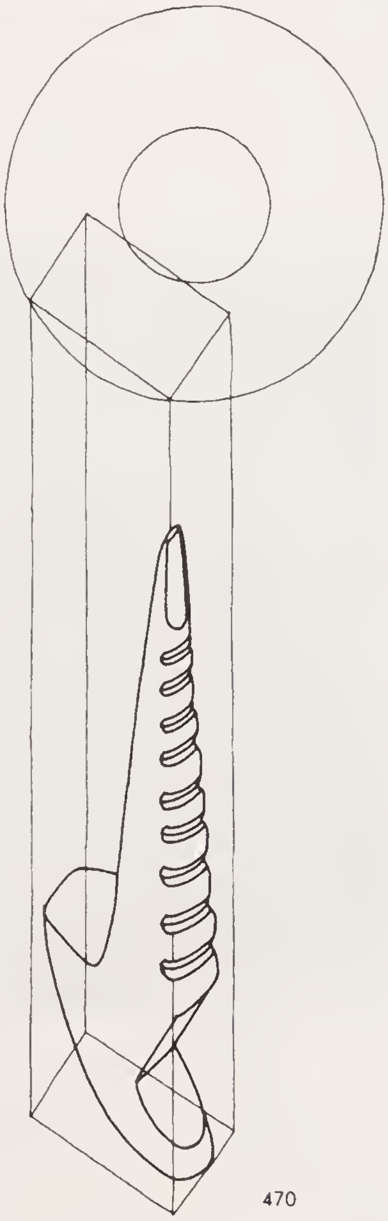
Rim

The rim-strengthening detail is rather elaborate and decorative. The rim strengthening is done with three pairs of rings made of split bamboo, the edge of the weave sandwiched between each pair. These rings are arranged one above the other and each element on the outer surface of the side weave has a corresponding ring on the inner surface. The upper and lower sets are thin splits with a small square cross-section while the one in the middle is wide and thick. These are fixed together, as well as to the side weave, by a length of split-cane binding. This forms a fairly flexible but a strong rim structure, which is highly decorative (fig. 471).

Other baskets are made using shaped whole culms of bamboo as legs. The *shangbai* is one such basket.

Chengamuk

The *chengamuk* is a small bamboo basket with legs used by the Manipuris to wash rice (fig. 472). It has a square base of diagonal 100 mm and a circular rim of diameter 150 mm. The height of the basket is 140 mm including the legs. The weave structure and rim detail are identical to the *thumok*, the only difference being in the leg detail. Four legs are shaped from a whole bamboo member, where the complete node is retained at the lower end, while the upper part is shaped to fit the corner of the square base and shaped like a spine which is inserted into the side weave to strengthen the sides as well as to anchor the legs. These elements are fixed to the basket by split-cane binding.



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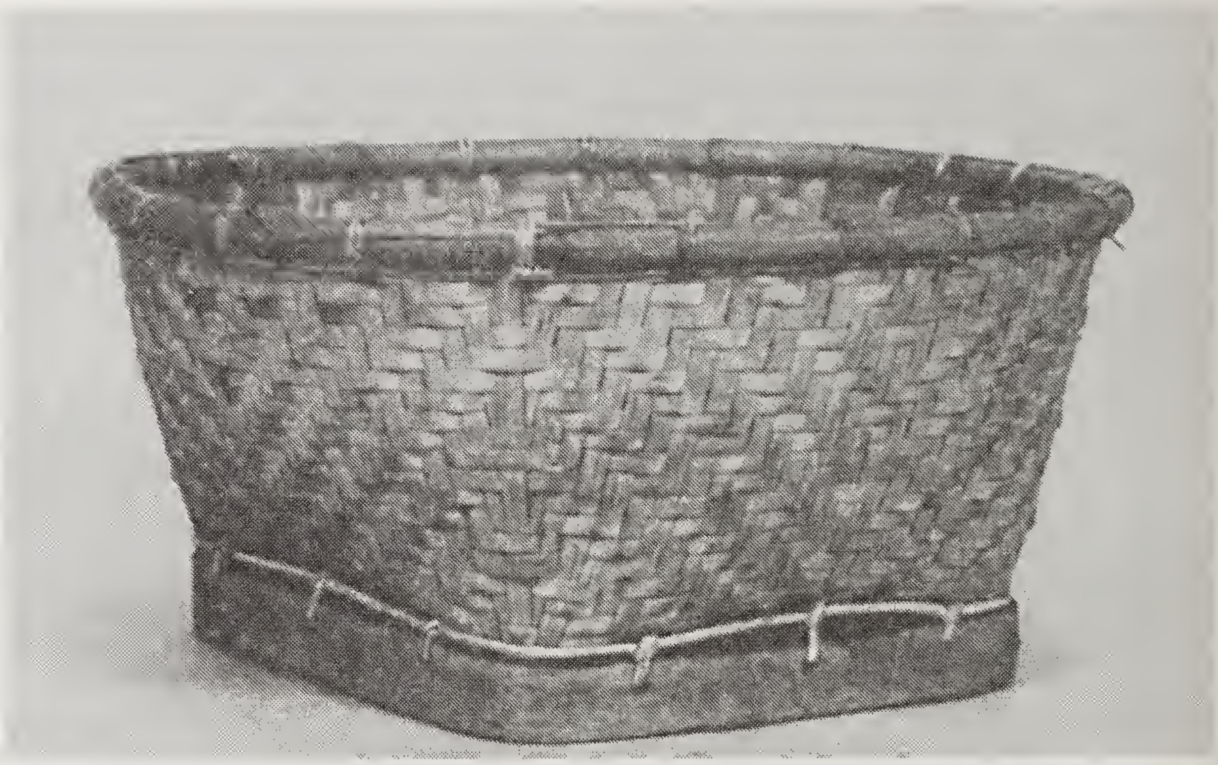
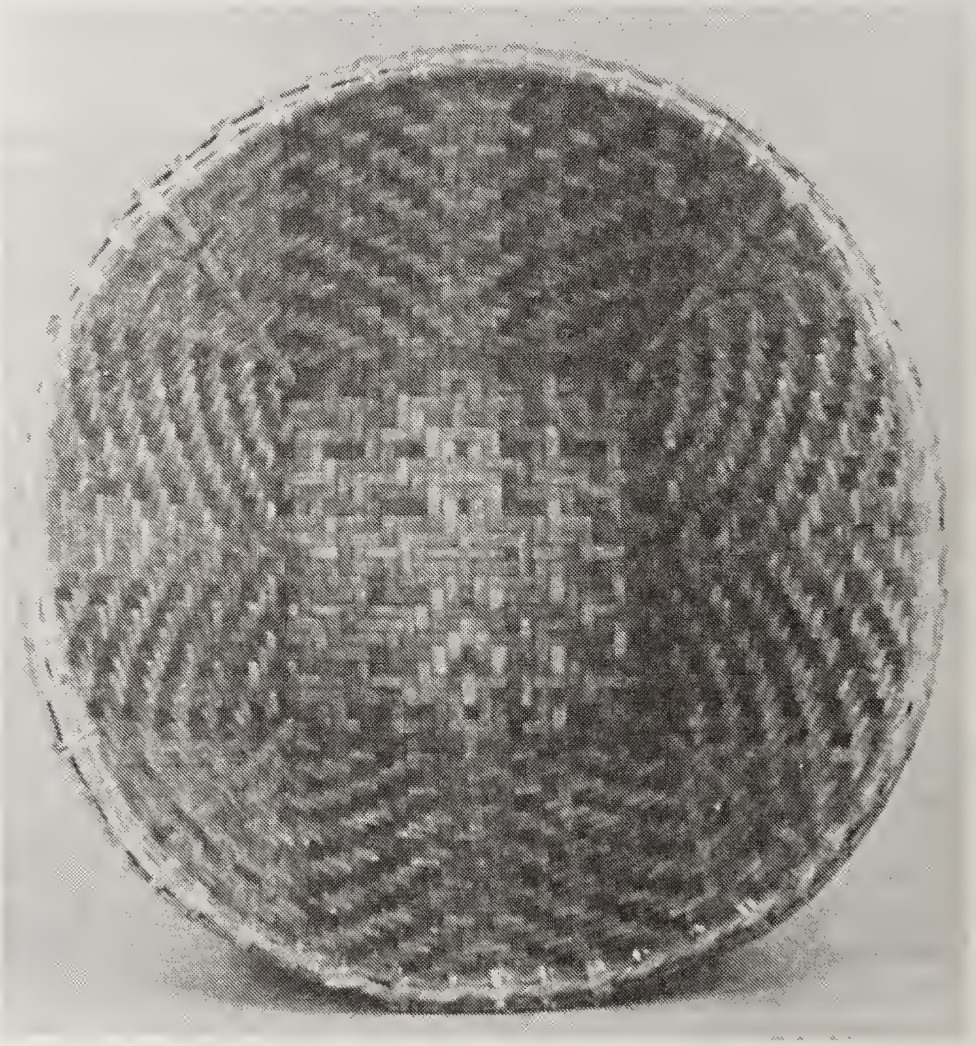


473

Dimasa Cachari Shallow Basket

This basket is used primarily as a storage and shop display container at weekly bazaars (fig. 473). With a square base and a circular rim, it is woven from bamboo splits in a construction similar to the *longkhai,* which is the Dimasa Cachari carrying basket. The perimeter of the base is strengthened in a similar way by a ring bent from a strip of wood which is fixed to the base by split-cane binding. The rim-strengthening detail is, however, different. Here the edge of the weave is sandwiched between two rings made from half-cane splits and bound by split-cane binding. The shallow basket has a square base of diagonal 260 mm, the rim diameter is 340 mm and its height including the 25 mm wide wooden band is 160 mm.

476



475

Shang

The *shang* is a shallow storage and shop-display basket used by the Jaintia tribe of Meghalaya (fig. 474) and made from split bamboo.

Size and Structure

It has a square base of diagonal 240 mm and the sides spread out to a circular rim of diameter 430 mm. Its height is 240 mm. The base is woven in a twill weave in a four-fold symmetry around the centre (fig. 475).
A spiralling weft element forms the side weave which has an inverted herringbone pattern along the centre line of each side.

Base and Side Strengthening

The sides and base of the basket are strengthened by two elements of bamboo outer split. These are placed under the base to form the diagonals of the base square, before the ends of these elements penetrate through the weave at the corners of the base square, to move up the sides vertically, up to the rim, as extra-warp elements on the inner surface of the basket. These elements are bent over the top edge to run parallel to the warp and form a strengthening extra-warp element on the outer surface of the basket. In addition to these, more extra-warp elements are added in order to close the expanding gap generated by the increasing diameter.

The sides and base of the basket are further strengthened by a bamboo structure attached to the outer surface of the basket (fig. 476). This structure uses a wide bamboo split bent around the perimeter of the base square and the two ends of this split overlap along the full length of one side. This split is quite thick and in order to achieve a sharp right-angled bend the thickness of the split is reduced, by removing material on the inner surface of the split at the point where the bend is desired (fig. 477). At each corner of this square band, four vertical strengthening elements are attached with split-cane binding. These elements are shaped from whole-bamboo lengths of a small

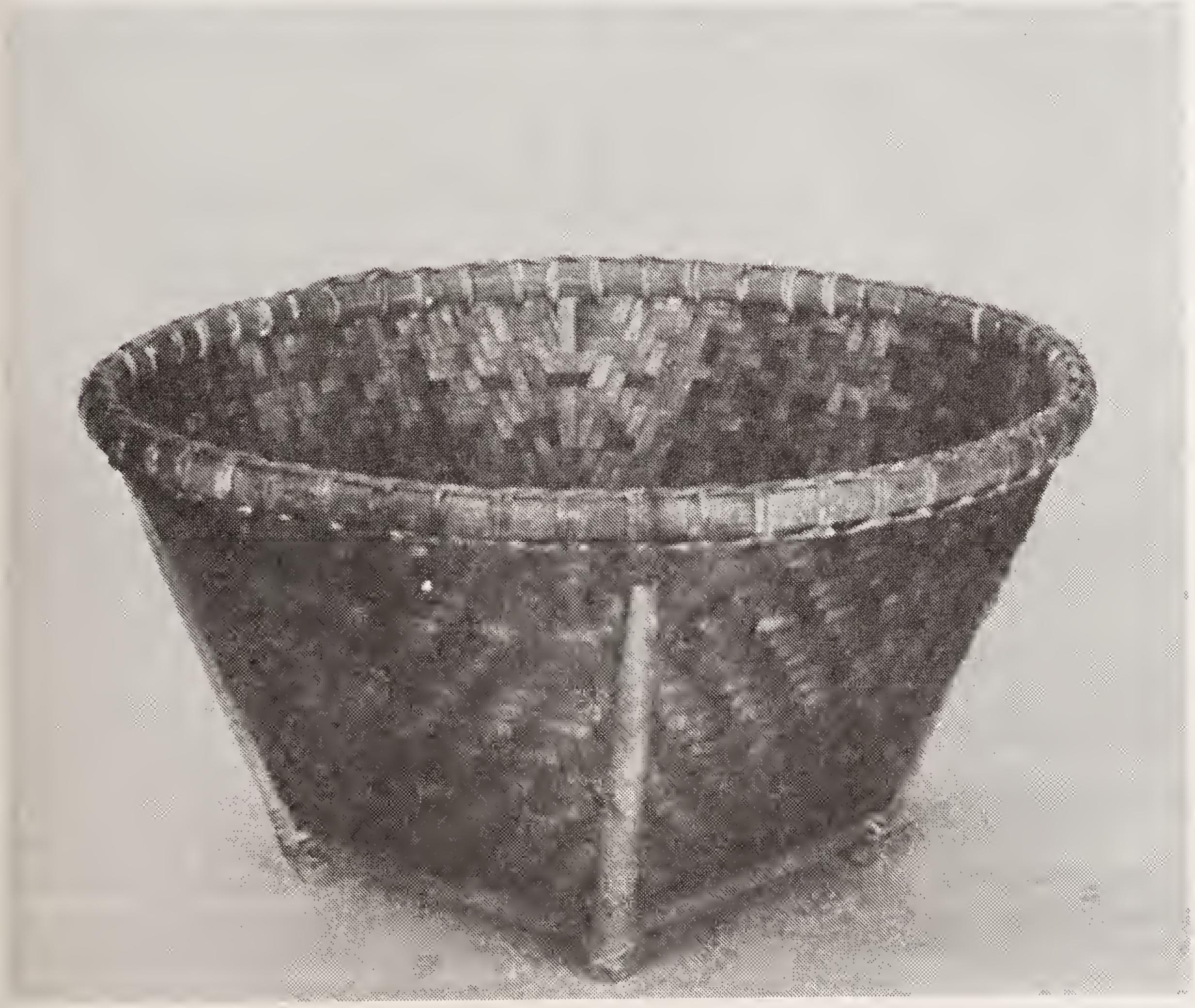
473: A Dimasa Cachari basket for storage.

474: The *shang*, a Jaintia storage basket.

475: The *shang* as seen from above.

476: The *shang* resting on its rim.

477: The thickness of the split is reduced where it is to be bent at the corner of the base.



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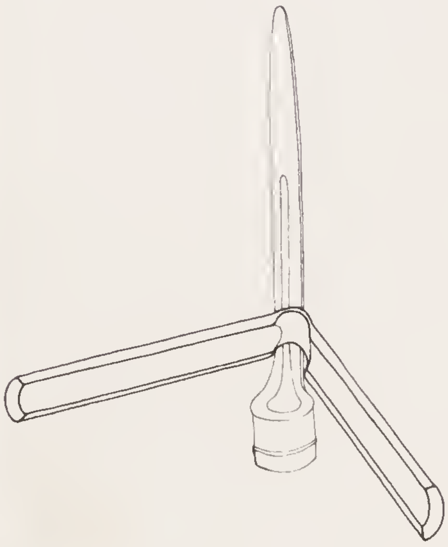

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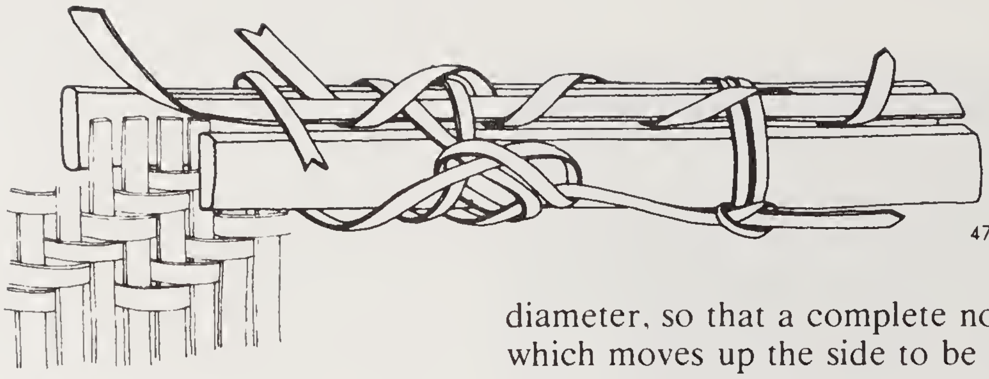
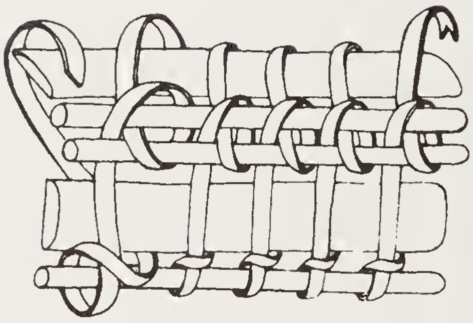


diameter, so that a complete node remains below the band. The upper part which moves up the side to be tucked into the weave near the rim is shaped like a spike which gradually narrows down towards the tip.

Rim

The rim is strengthened by sandwiching the edge of the side weave between two rings made from wide, thick splits of bamboo. The split-cane binding passing over the top of the rim is protected from damage by abrasion by an additional binding made of two thin but wide splits of bamboo. One of these splits runs parallel to the rim at the top edge, passing under the split-cane binding while the second split is wrapped round the first to pass diagonally over the split-cane binding at each turn of the wrapping (fig. 478).



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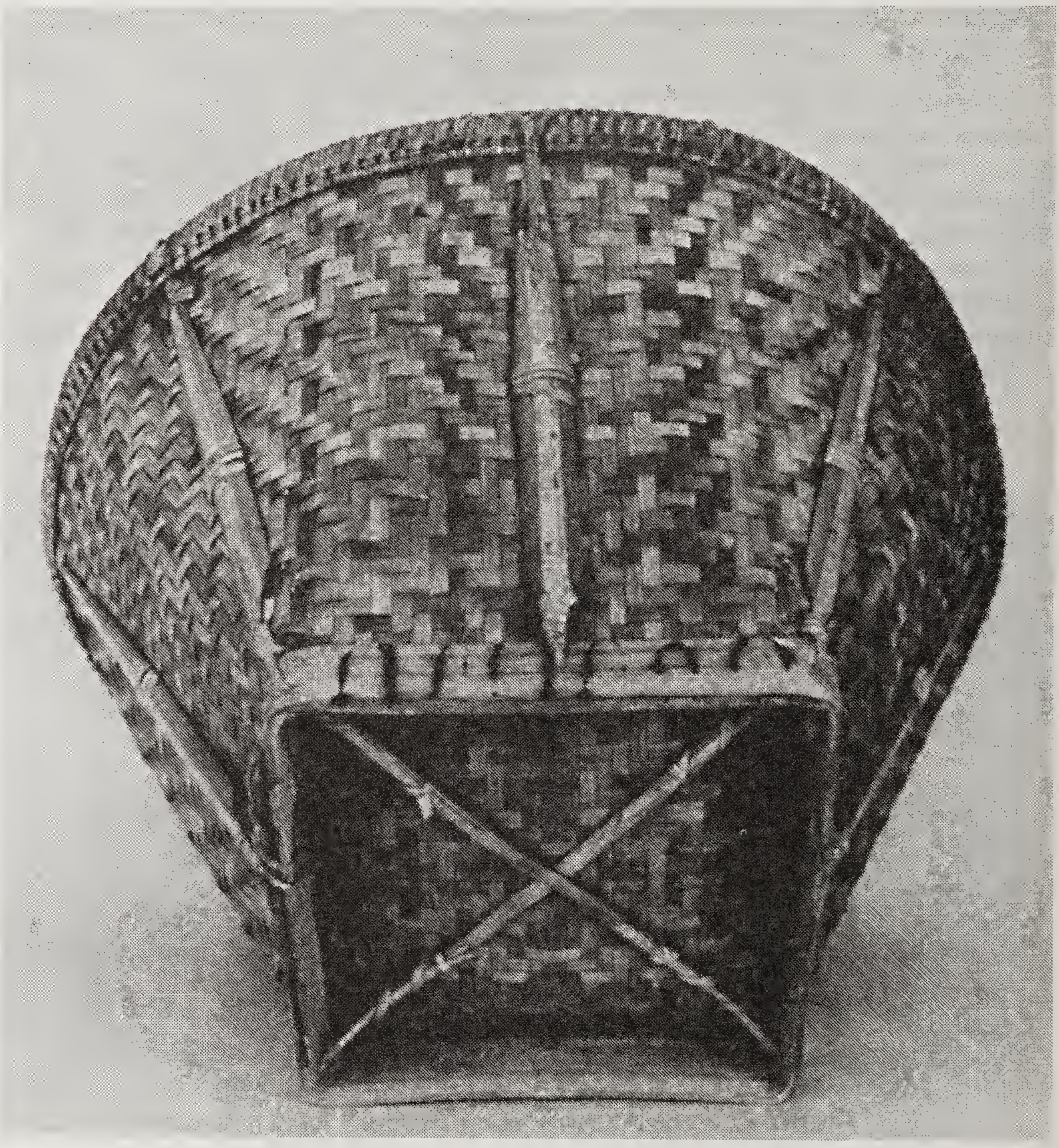
478: Detail of the rim binding of the *shang*.

479: The Khasi shallow basket resting on its side.

480: A flattened view of the rim binding as seen from above.



479

Khasi Shallow Basket

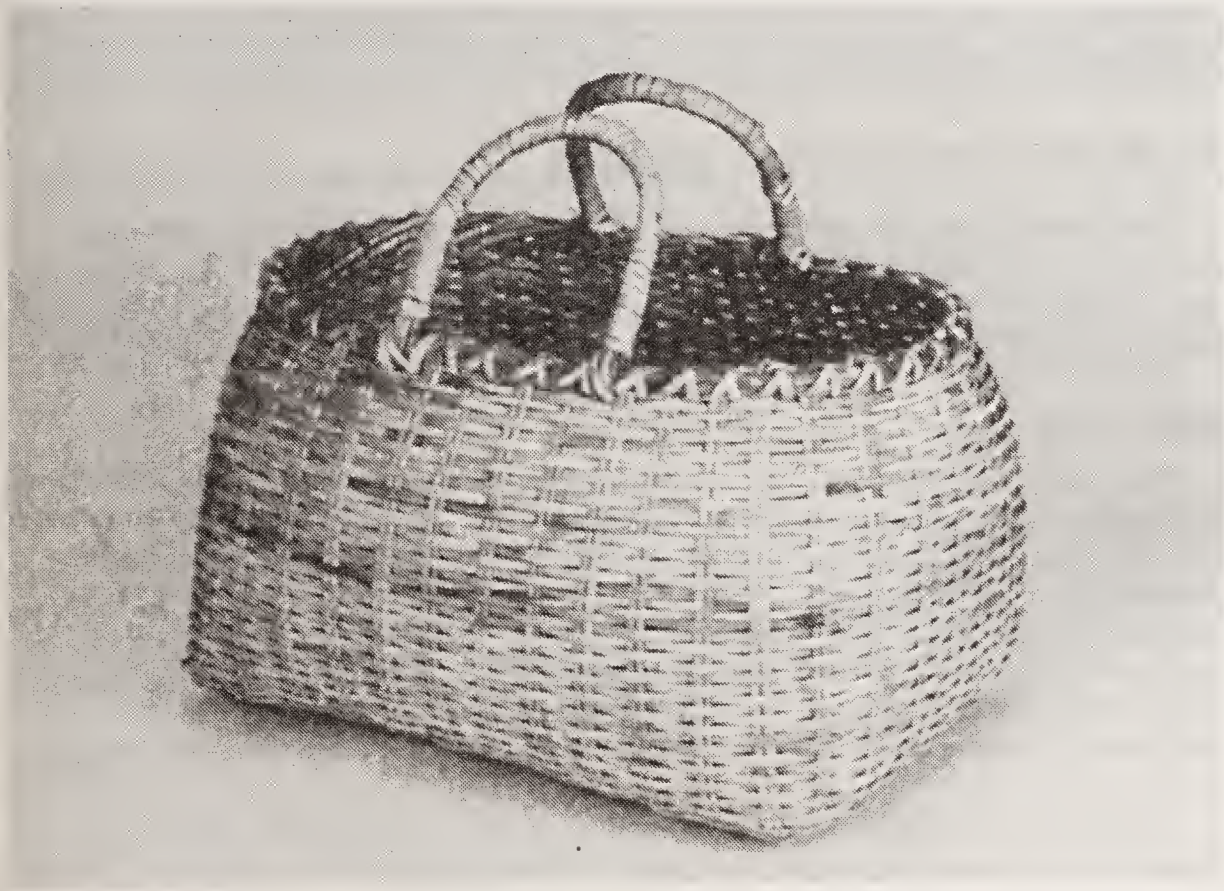
The Khasi basket is woven from split bamboo and the weave structure is identical to the Jaintia *shang*. The differences lie in the rim-strengthening detail and the side-strengthening structure.

Size and Structure

The diagonal of the base square measures 240 mm, the diameter of the circular rim is 360 mm and its height is 230 mm. The base is strengthened by a wide, thick split of bamboo, which is bent to form a square band, on which the basket rests (fig. 479). This split is 35 mm wide and 4 mm thick and made from a bamboo of fairly large wall thickness. Eight side-strengthening elements of wide bamboo splits are attached to the band, four at the corners and four at the centre of each side. These splits are shaped at both ends The upper end, which is tucked into the side weave near the rim, continues to penetrate the rim-strengthening construction and is gradually tapered to form a spike. At the other end the width and thickness are sharply reduced. These ends pass through holes in the base-strengthening band, to be bent around, to return vertically up on to the bottom surface of the band, before being bound by split-cane binding. This concept of reducing the width or thickness to achieve flexibility in an otherwise rigid bamboo member is an interesting structural feature of Khasi and Jaintia products.

Rim

The rim-strengthening binding used in this product is both functional and decorative (fig. 480). The upper edge of the side weave is sandwiched between two rings of wide bamboo splits and the split-cane binding passes alternately over two thin rings located at the top edge. There is another thin ring on the outer surface located just below the wide ring.

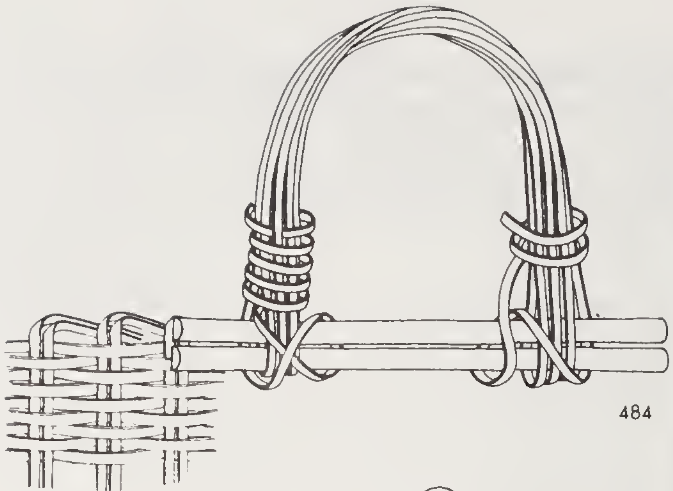


481

481: A marketing basket from Gohpur in Assam.

Shopping Baskets

The settlers of the plains of Assam and Manipur use shopping baskets which are carried in the hand for occasional trips to markets and bazaars. The baskets are made in fairly large quantities by professional craftsmen and are sold through the weekly bazaars. Several shops in the various towns have stocks which are readily available. Most of these baskets are made from split cane woven to form the container and provided with two strong handles fixed on opposite sides of the rim. Both handles are held together in one hand when the basket is carried.



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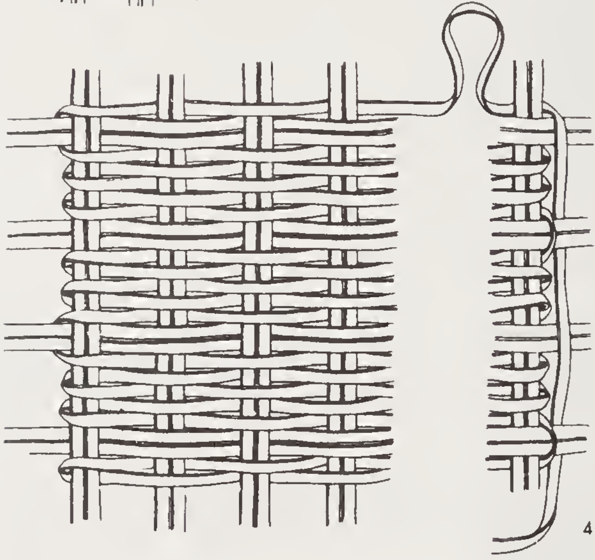

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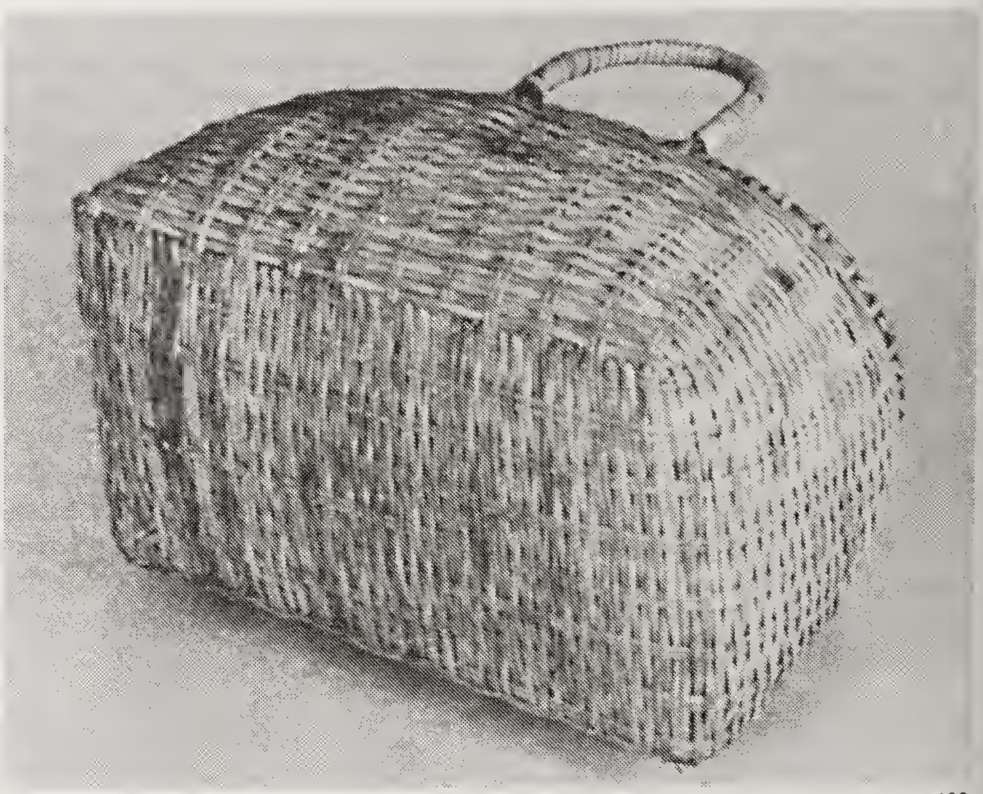


482

482: A view of the base.

483: A cutaway view of the construction of the base showing the filler element which continues around the sides.

484: Detail of the construction of the handle.

Marketing Basket from Gohpur

This basket has a rectangular base of size 380 mm by 220 mm and the sides bulge out slightly before narrowing to form an elliptical rim of major axis 370 mm and minor axis 240 mm. The height of the basket, excluding the handles, is 220 mm (fig. 481).

Base Weave

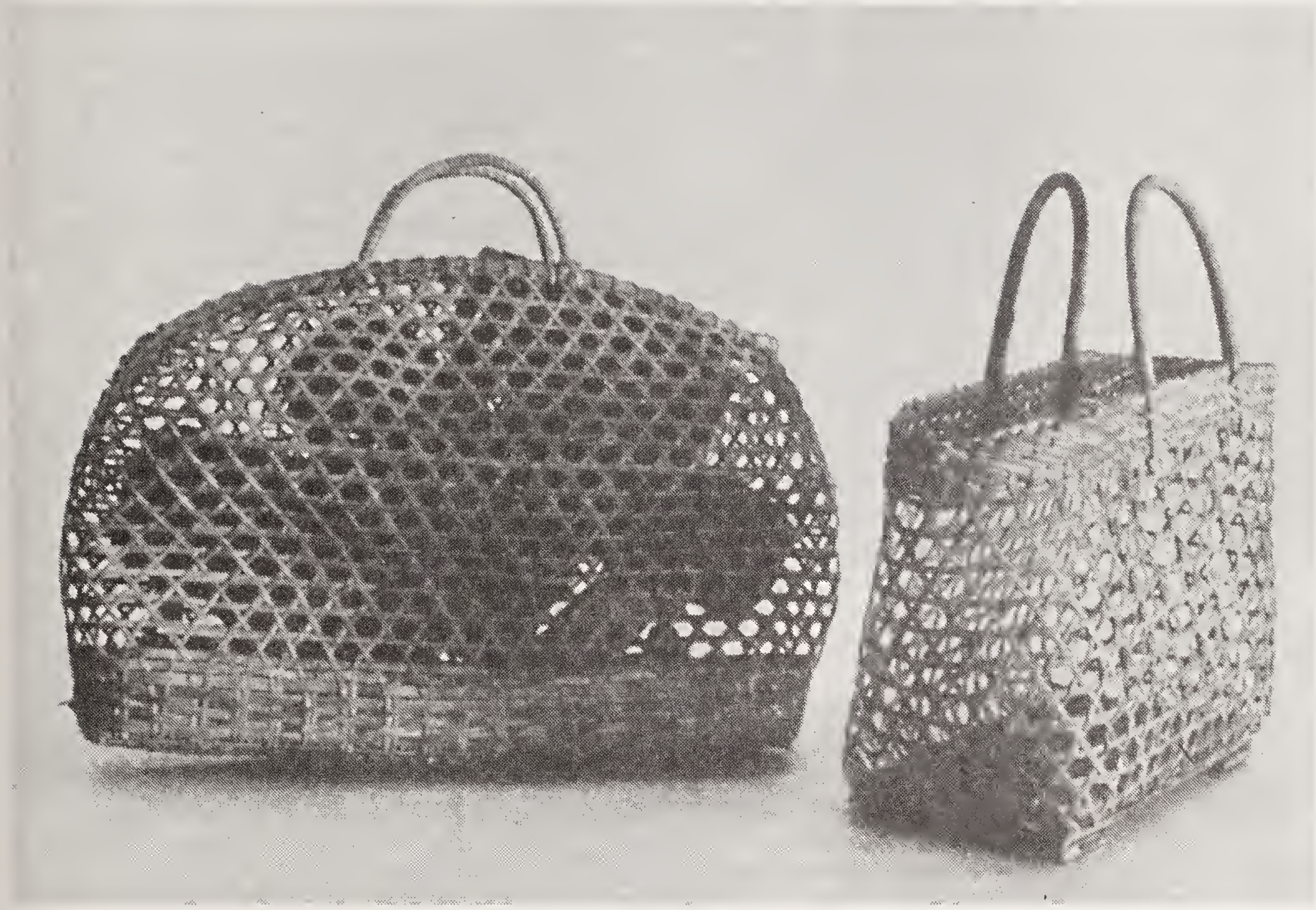
The base is formed by two sets of elements overlapping in a mutually perpendicular orientation leaving open spaces between (figs. 482, 483). These elements are bent up to form the warp and each element is a pair of cane splits taken together. These warp elements overlap, but do not interlace, as elements forming one parallel set are arranged to pass alternately above or below the elements of the second parallel set. The interlacing is effected by a space-filling element, which is a continuous length of split cane, moving back and forth across the base, parallel to the second set of warp elements and interlacing the first warp set.

Side Weave

The sides of the basket are formed by a spiralling weft element of split cane weaving in a tabby structure. At one corner of the base an extra-warp element is added to create the odd number of elements required while using a single-start spiral in the weft.

Rim and Handles

The rim of the basket is strengthened by a ring formed by a pair of whole-cane elements taken together and the warp ends are bent to lie parallel to the ring, before being bound to the ring by split-cane binding. Each handle is formed by several split-cane elements looped around the strengthened rim, to form two hinges linked by an arch, before the upper part of the handle is wrapped by a split-cane element (fig. 484).



485

485: Marketing baskets from Imphal.

Marketing Baskets from Imphal

Two types of marketing baskets were seen in Imphal, the capital of Manipur State. Both are woven from split-cane elements and each one is made like a bag with two handles provided at the rim (fig. 485). Similar in construction, both baskets have rectangular bases woven in an open basket weave and the sides in an open-hexagonal weave.

Soft Rim

The main difference lies in the rim or mouth of these baskets. The first has a soft rim self-strengthened by a woven border while the other has a rim strengthened by two stiff splits of cane. The soft-rimmed basket has a mouth that remains wide open like a narrow ellipse and the arch-shaped cane handles are attached to the longer sides of the rim.

Stiff Rim

The second basket, with the stiffened rim, remains shut like a pair of closed lips in the normal position and these can be pushed apart to widen the gap in order to put things inside. The lip-like rim, strengthened by a bow-shaped element, closes when released and the basket is carried with two arch-shaped handles attached to the middle of each lip. In this basket the open-hexagonal weave continues around the basket upto the beginning of the rim and is formed by a continuous spiralling weft element. Above this point the warp knots around each rim-strengthening element.

Size and Shape

This basket is quite flat, as the base rectangle measures 400 mm by 100 mm and the height is 320 mm. The weave used in the base is similar in principle to the Gohpur marketing basket, where the two sets of warp elements overlap in a mutually perpendicular orientation with gaps between these closed by a space-filling element, which also acts as the binding element by interlacing two sets.

Tiffin Baskets

The primary occupation of the hill tribes of the northeastern region is agriculture and a majority of these tribes practice *jhum* cultivation or the slash-and-burn technique in preparing their fields. This is a shifting form of cultivation with new sites being selected each year. They return to the first site after a rotation cycle of seven to twelve years. Located on hill slopes around their village, the sites are often a considerable distance away; hence they leave the village very early to return late in the evening.

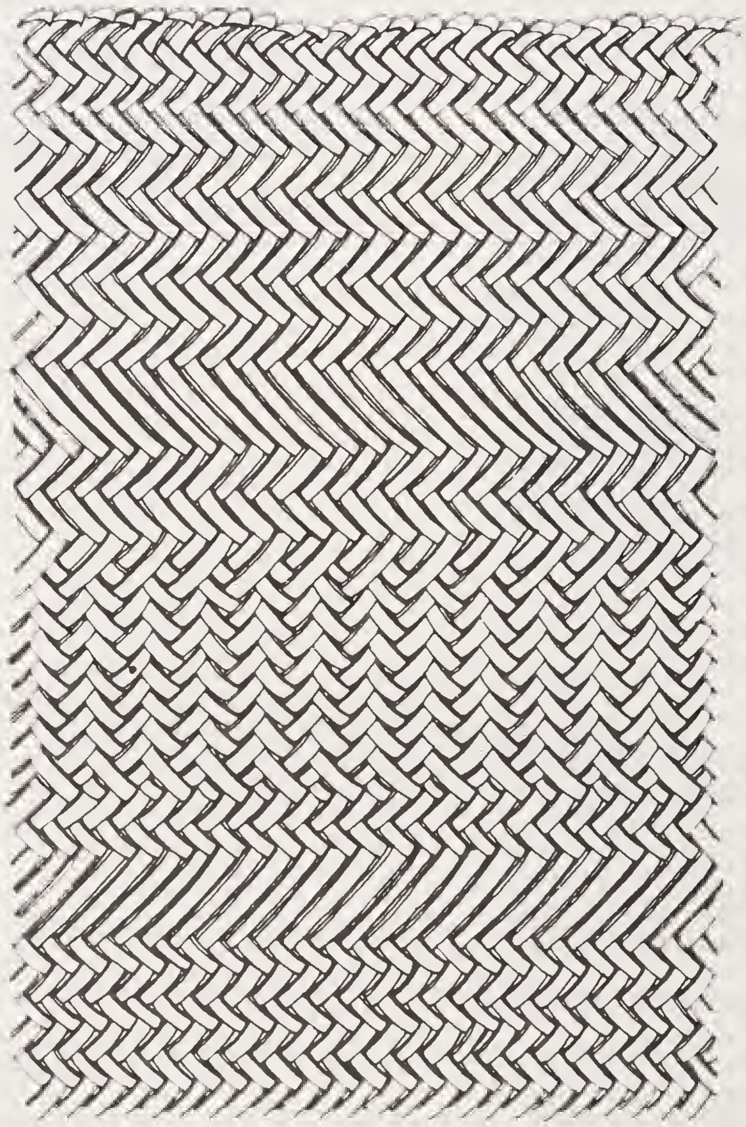
Cooked food, normally boiled rice and a small quantity of chutney to add spice, is carried with them to the *jhum* fields in baskets specially made for this purpose. Each tribe has evolved its own forms to suit its needs. Some of these baskets are provided with handles while others have short straps to be suspended from the belt or waist hand. All these baskets have lids which fit snugly over the mouth and many of them are woven with a double-wall structure where the outer layer is decorative and the inner layer made in a closely-packed weave structure.

Chikomong

The *chikomong* is a tiffin basket woven from bamboo splits and used by the Ao Naga tribe to carry cooked rice to their *jhum* fields. It is shaped like a rectangular prism when the lid is closed and it has two arch-shaped handles made of split cane. These are attached to a cane ring fixed to the outer surface of the basket just below the edge of the lid which overlaps the sides near the rim of the basket (fig. 486).

486: The *chikomong*, an Ao Naga tiffin basket.

487: Detail of the side weave.



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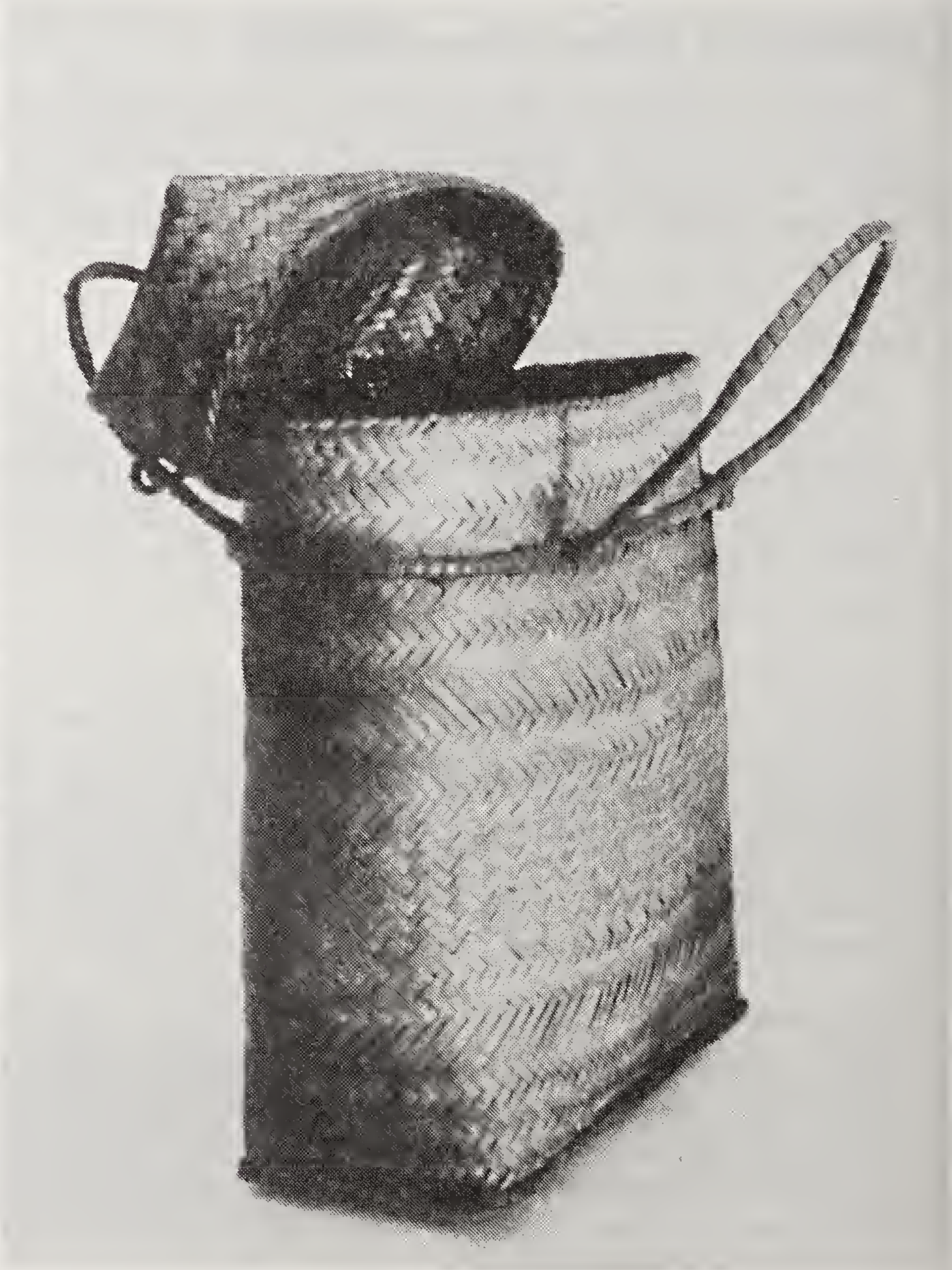

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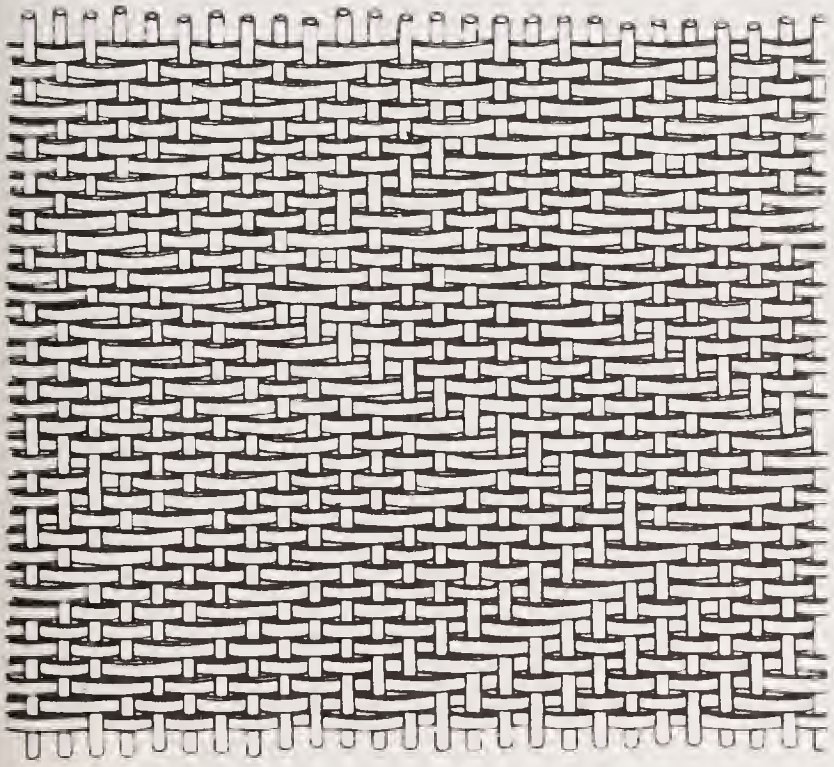
Size and Structure

The rectangular base of this basket measures 240 mm by 100 mm and its height excluding the arch-shaped handles is 280 mm. The container part of the basket is woven using the diagonal-weaving method and the perimeter of the base is strengthened by split-cane elements wrapped around by another split-cane element which intermittently binds into the weave structure. The two sets of inclined elements forming the sides interlace in a twill structure, in a decorative manner, creating horizontal bands around the basket, each varying in texture (fig. 487).

The rim is self-strengthened and finished to create a soft edge. Here all the elements inclined in one direction in the side weave are cut at one horizontal level at the desired height, while those inclined in the opposite direction are twisted rope-like to facilitate bending of these splits. These are then tucked back into the weave inclined in the direction of the cut elements. The shape of this rim is elliptical. The lid is woven in the same way and the rim detail of the lid is identical to that of the basket. The lid fits snugly over the mouth of the basket. Both container and lid have a single-wall structure.



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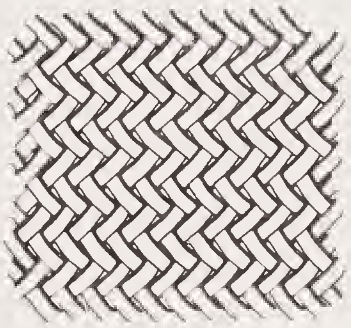

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488: A diagram showing the different woven parts used to make the *janpong*.

489: The decorative weave used in the outer layer.

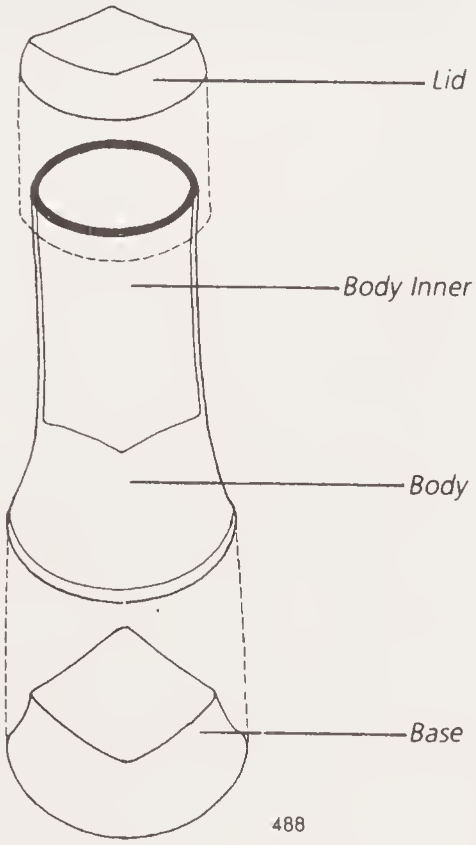
490: Weave structure of the inner layer.

Janpong

The *janpong* is another Ao Naga tiffin carrier made from split bamboo. The form and construction is quite different from that of the *chikomong*. The sample acquired is a miniature version of the original *janpong*. The container has a double-walled structure made up of closely-fitting and overlapping woven layer's bound together at the edges (fig. 488).

Structure and Construction

The outer layer is woven from fine splits in a decorative twill structure while the inner is woven from wide splits of bamboo in a closely-packed weave using a patterned weave construction (fig. 489). The outer layer is like a hollow tube open at both ends. The upper part of the outer layer fits tightly around the inner layer while in the part extending below the base of the inner layer, the diameter gradually increases upto the lower edge. The hollow space created below the inner container receives an inverted container, woven in the diagonal-weaving method (fig. 490). The open edge of this is bound to the lower edge of the outer layer just as the upper edge of the outer layer is bound to the rim of the main inner container. An arch-shaped handle is fixed to opposite sides of the basket. The lid is woven as a square based basket with a circular rim using the diagonal-weaving method. The weave used to form the square top has a decorative pattern.



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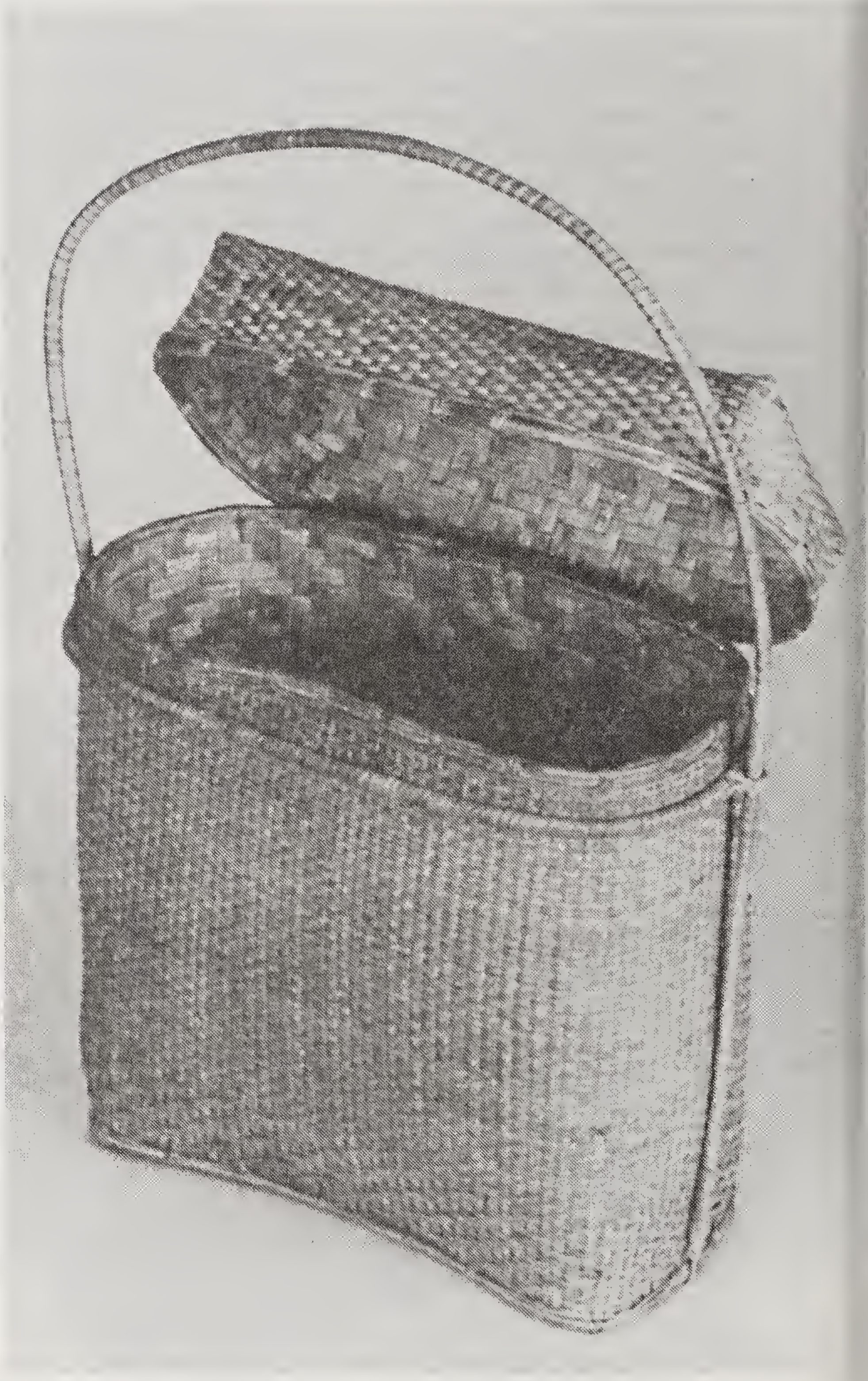


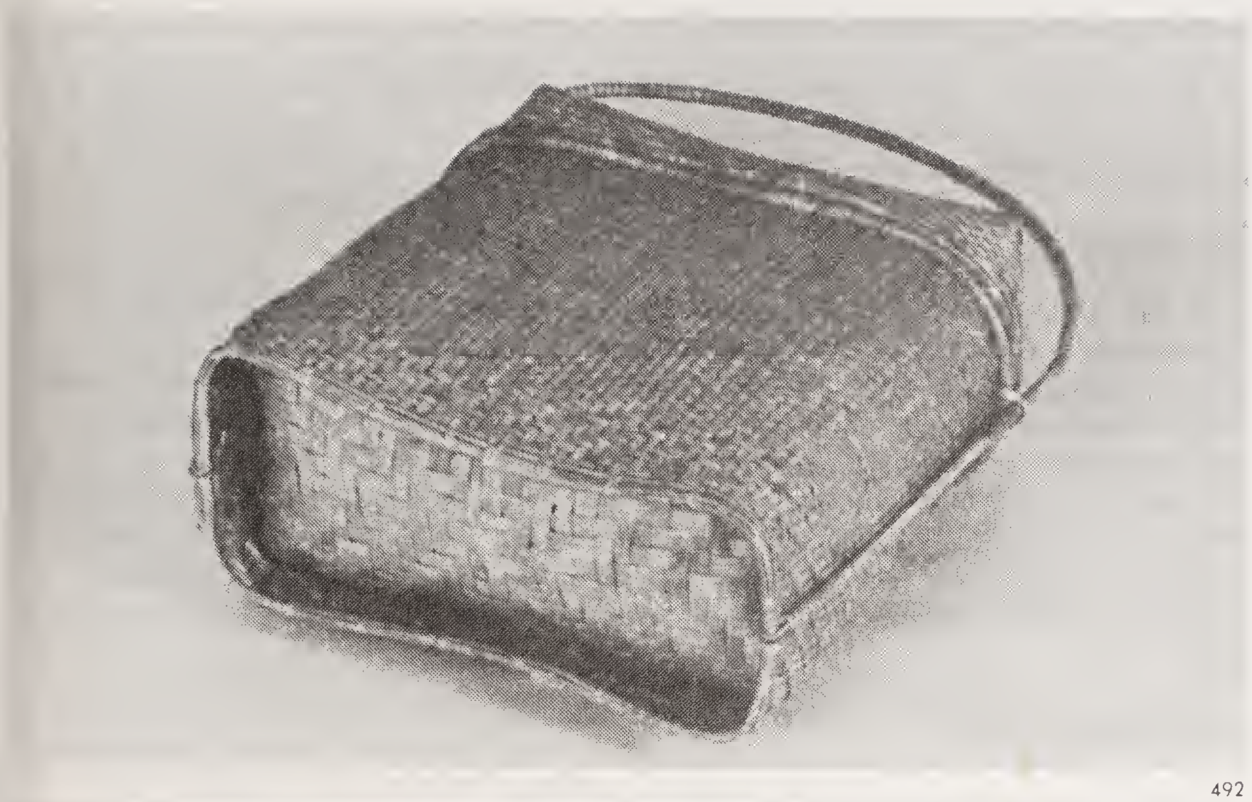
491

Chang Naga Tiffin Basket

This basket is used by the Chang Naga tribe of Tuensang District to carry cooked rice (figs. 491. 492). The basket with its lid closed is shaped like a rectangular prism and the two ends of the arch-shaped handle passing over the top of the basket are fixed to the base on opposite sides.

Size and Structure

The rectangular base measures 280 mm by 140 mm and its height excluding the handle is 300 mm. The highest part of the handle passes 150 mm above the top of the lid. Both container and lid are woven in a double-wall structure where the inner layer is woven from wide bamboo inner splits while the outer layer uses fine bamboo outer splits. The inner container has a rectangular base formed by interlacing warp elements and its sides are formed by a spiralling weft interlacing the warp in a twill structure. The outer layer of the container is like an open sleeve which fits closely around the inner container. The upper edge of this sleeve is strengthened and bound to the rim of the inner container, while the lower edge of the sleeve extends below the base of the inner container. The open edge is strengthened by sandwiching between split-cane elements bound by split-cane binding.



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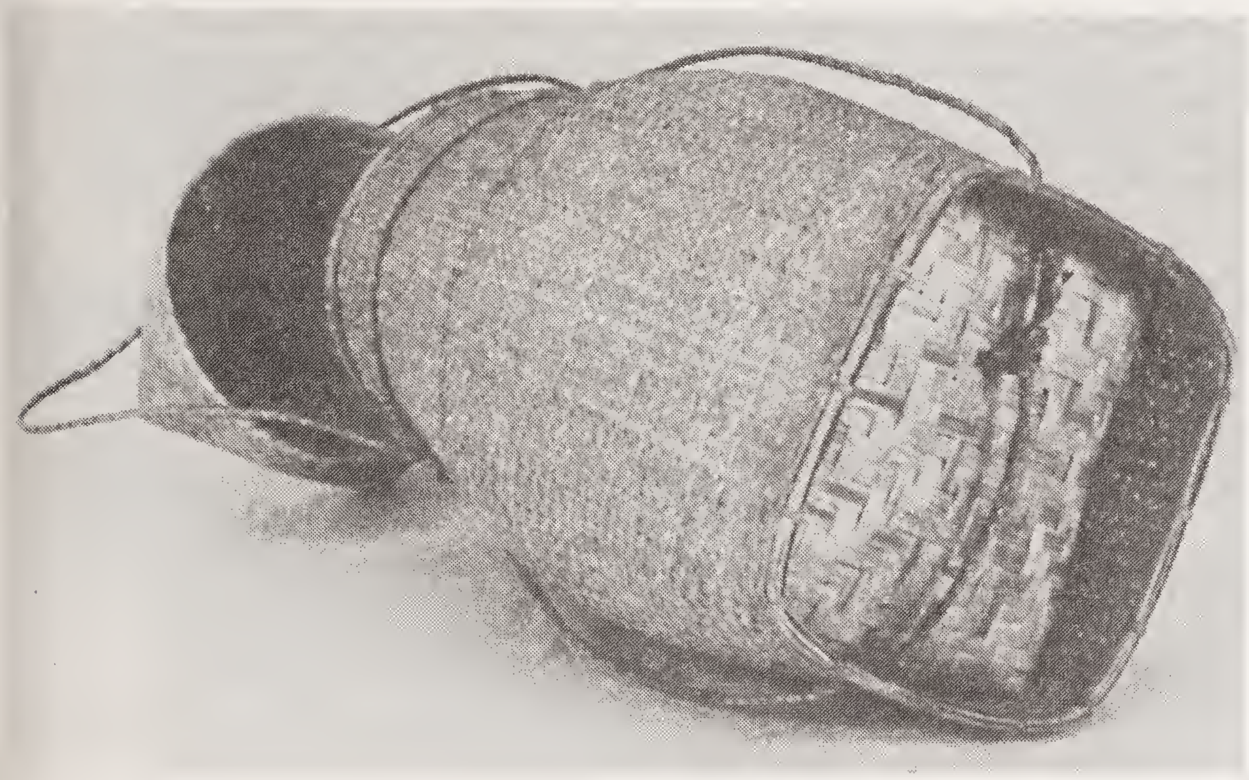

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491: The Chang Naga tiffin basket.

492: A view of the base of the basket.

493: The Chang Naga seed basket.

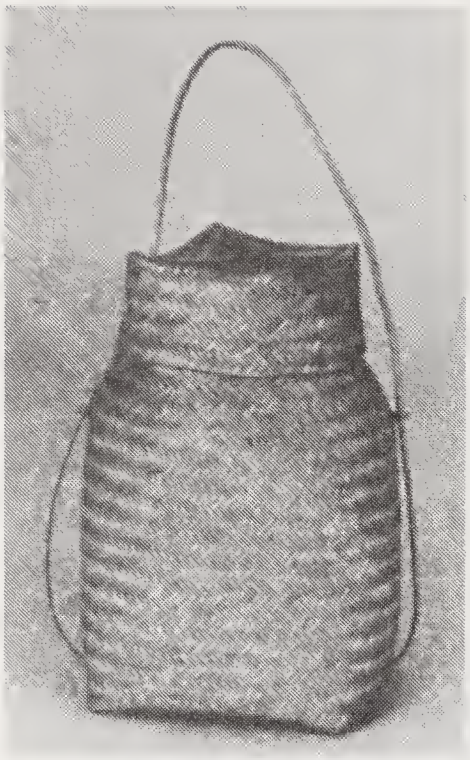
494: A view of the base of the basket.

Lid Structure

The inner layer of the lid is formed with a weave structure similar to the inner layer of the container, while the outer layer of the lid completely covers the outer surface of the inner layer and the open edge of both layers are bound together by a strengthened-cane binding.

Chang Naga Seed Basket

The Chang Nagas use a basket to store and carry seeds, similar in construction to the basket used for cooked rice, though the form is different (figs. 493, 494). The basket is woven from split-bamboo elements and is bottle-shaped with a square base. The sides near the base are vertical while towards the top it narrows down to form a circular rim. The container part has a double-walled construction just as in their tiffin basket, while the lid is woven in a single layer formed by the diagonal-weaving method. The handle for this basket is a cane braided strap. Each end passes through two loops attached to a side-strengthening band. These ends pass through two holes on opposite sides of the outer layer of the basket to be knotted together at the bottom.



497

495: A tiffin basket from Kohima in Nagaland.

496: The top is narrowed by overlapping adjacent elements.

497: A similar but smaller basket from Noklak in Nagaland.

Tiffin Basket from Kohima

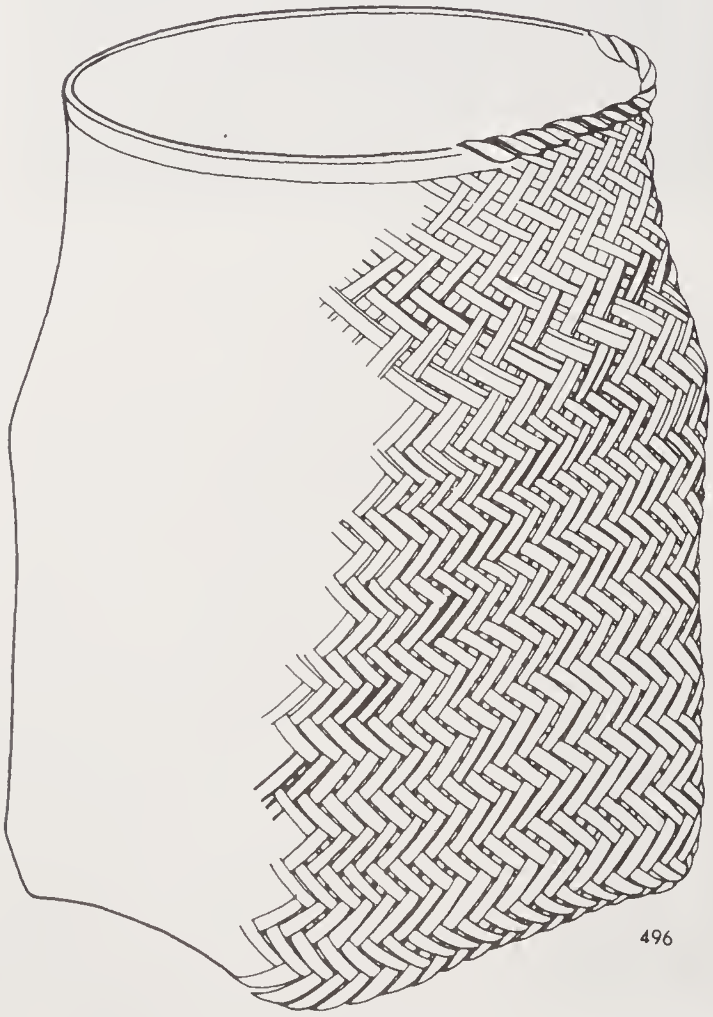
This basket is used by Naga tribes to carry cooked rice to the fields. It is woven from fine bamboo splits in a single layer using the diagonal-weaving method (fig. 495).

Size, Shape and Structure

It has a square base of diagonal 180 mm. The sides near the base are vertical but it narrows down at the top, to form a circular rim. This narrowing down is achieved by overlapping pairs of adjacent elements of both the inclined sets of the side weave (fig. 496). The height of this basket is 220 mm. The lid covers the mouth and the sides near the rim. It is also woven in the diagonal-weaving method. The top of the lid is a square and the sides end in a circular rim which is self-strengthened. This is achieved by twisting and returning the elements of one inclined set back into the weave, forming a slightly raised edge, while the other set is cut at the level of this edge.

Construction Details

Both the square top of the lid and the square base of the container are strengthened by a pair of strong bamboo splits inserted into the weave, forming the diagonals of each square. Two loops of twisted bamboo splits, with a rope-like structure, are attached to the sides of the container and a similar loop is attached to the side of the lid. These loops receive a braided strap made from fine bamboo splits. Circular braiding is used to form this



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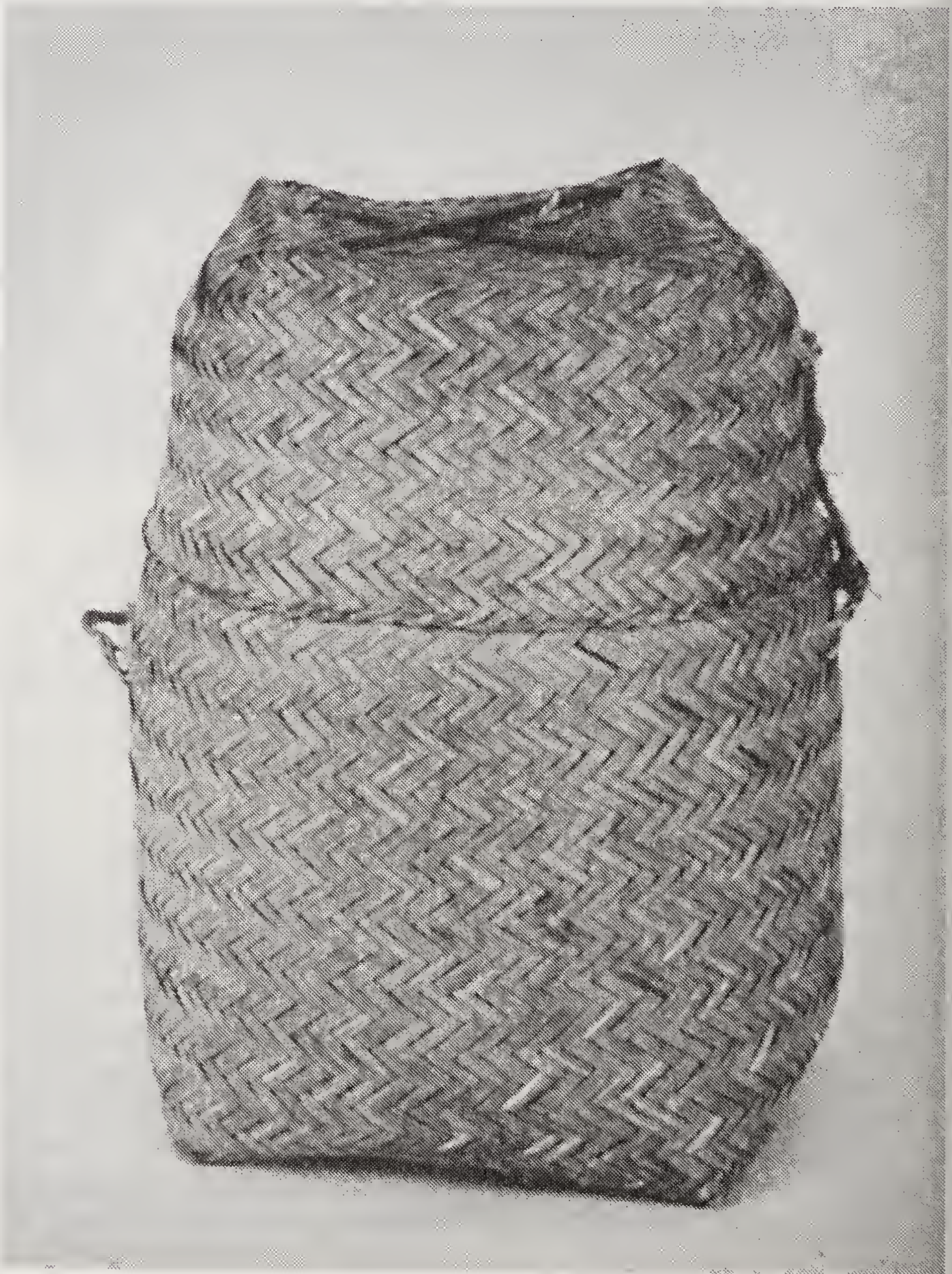


495

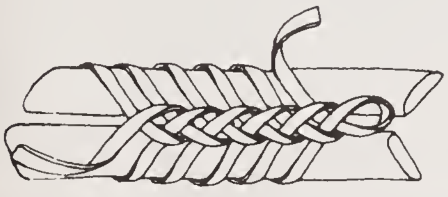
flexible strap. At both ends of this strap, the circular braiding is transformed into twisted ropes and these ends are knotted together below the base of the container.

An identical basket, though smaller in size, was acquired from Noklak village in Tuensang District (fig. 497).

Bunchung

The *bunchung* is a container used by the Monpa tribe to carry cooked rice to the fields (fig. 498). It consists of two semi-spherical parts woven from bamboo splits. The rim is strengthened by rings of split-cane and bound with split-cane binding (figs. 499, 500). One part is slightly larger than the other and the larger rim locks tightly around the rim of the smaller part to create a firmly closed container. The diameter of the larger rim is 200 mm and the depth of each part is 70 mm. Both container and lid are woven in the diagonal-weaving method in the shape of a shallow circular bowl.

Similar containers are used by the Bhutanese tribes. These are made from brightly dyed splits of reed, with the weave forming decorative geometrical patterns.



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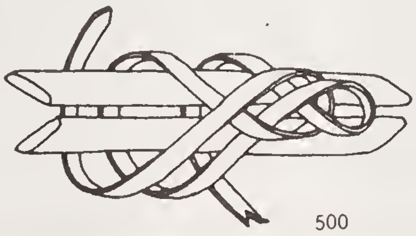

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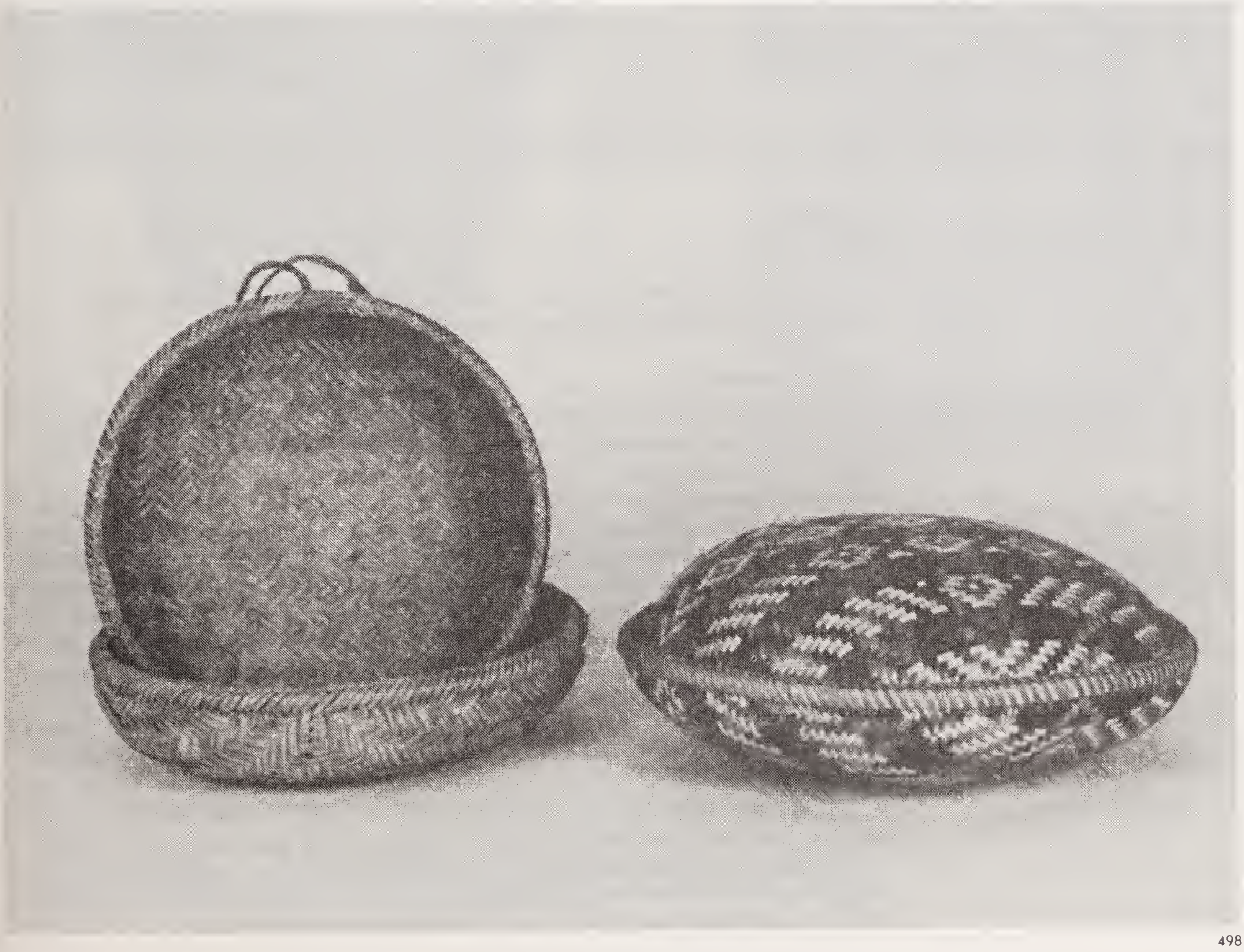
498: The *bunchung*, a Monpa food basket.

499: Detail of the rim binding.

500: The movement of the cane split used to bind the rim.



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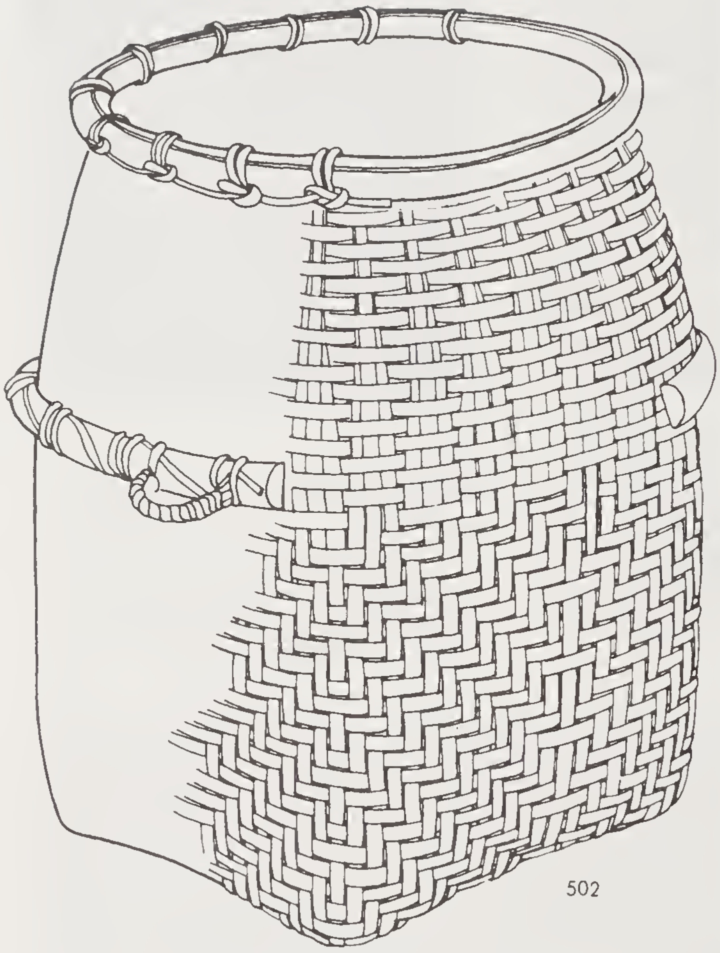
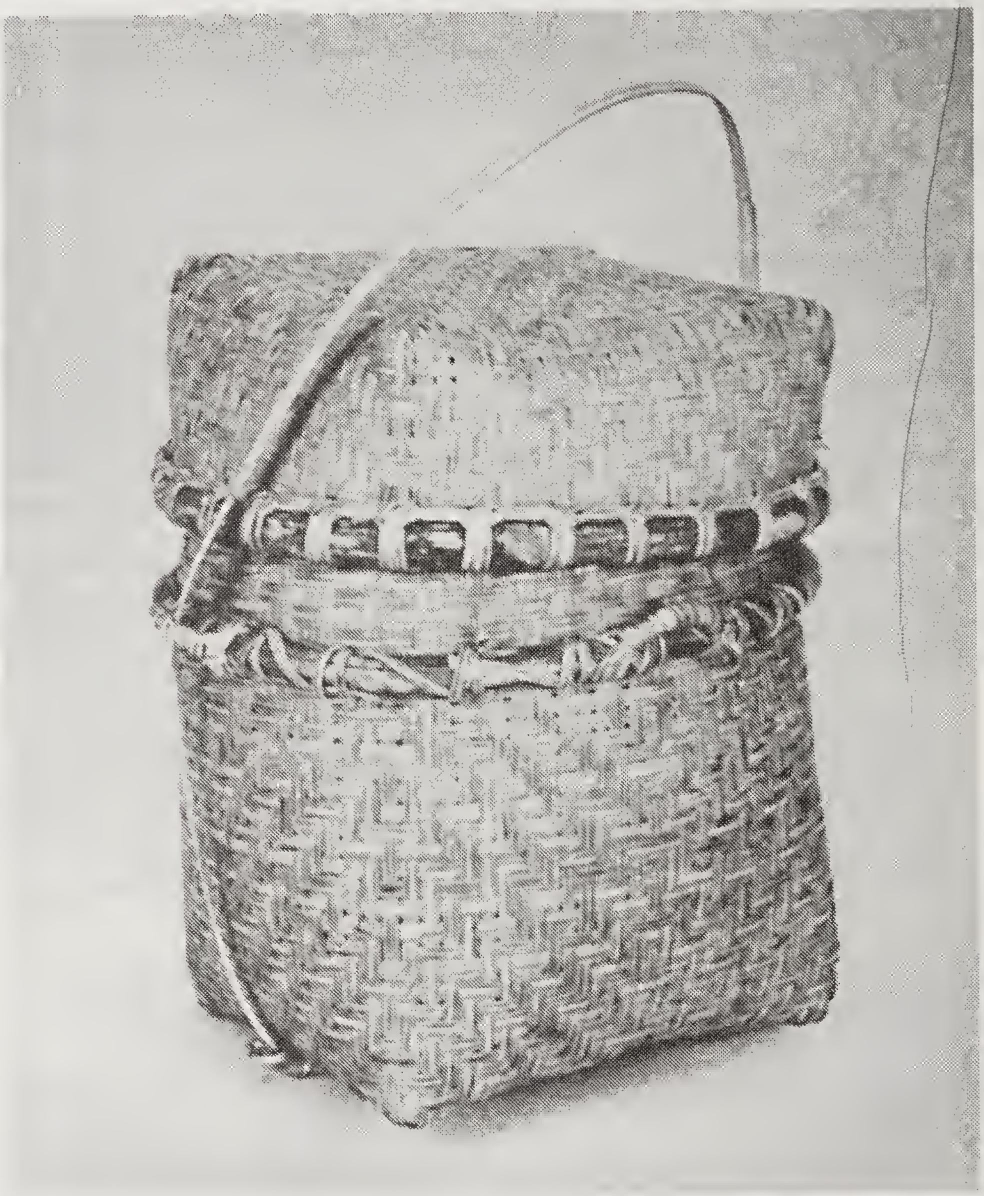
Small Storage Baskets





501: The *heding*, an Apa Tani basket used to store valuables.

502: Sets of warp elements are made to overlap in order to narrow the top.

Heding

The *heding* is a small bamboo basket with a lid used by the Apa Tani tribe of Arunachal to store their valuables (fig. 501).

Size and Structure

The container has a square base of diagonal 180 mm. The sides move vertically before narrowing down to a circular rim 140 mm in diameter. The height of the container is 190 mm. The square base of the container is formed by two sets of warp elements. These interlace in a twill weave with a four-fold symmetry around the centre. These warp elements are bent up and a spiralling weft element interlaces them to form the woven sides. In order to narrow down the top of the container, pairs of warp elements overlap while the weft continues spiralling (fig. 502). The rim is strengthened by sandwiching between split-cane rings, bound together by split-cane binding. The side of the container is also strengthened by a ring of half cane split passing over the outer surface. This is attached to the side weave by split-cane binding.

Lid and Other Details

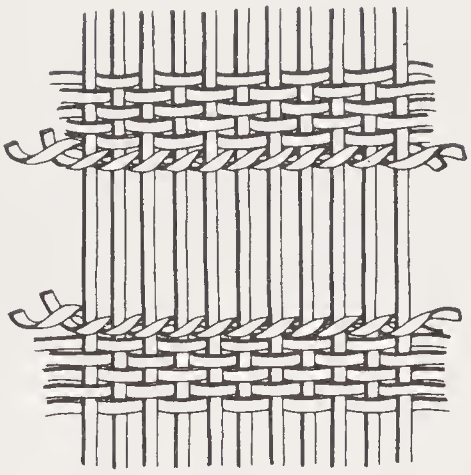
The lid construction is similar to that of the container and its rim is also strengthened in an identical binding. A handle, which is a single loop of split-cane is attached to the container by two loops on either side and the split-cane, passes under the base of the container. This basket is quite tough and bamboo outer splits are used for both warp and weft elements.

Khok

The *khok* is a basket used by the Nocte tribe to store their valuables (fig. 503).

Size, Shape and Structure

The basket is woven from split bamboo elements and has a double-wall structure. It is shaped like a vase with a circular rim and base, with the sides bulging out in the middle. The height of the basket is 350 mm and its maximum diameter is 230 mm. The two layers of the side are woven like coaxial tubes open at both rim and base. A lining of palm leaf is held between these two layers. The inner layer is a closed weave, formed by a spiralling weft interlacing vertical warp elements, while the outer layer has the spiralling weft forming three horizontal bands of a close weave structure, leaving two wide bands where the warp elements are exposed (fig. 504).



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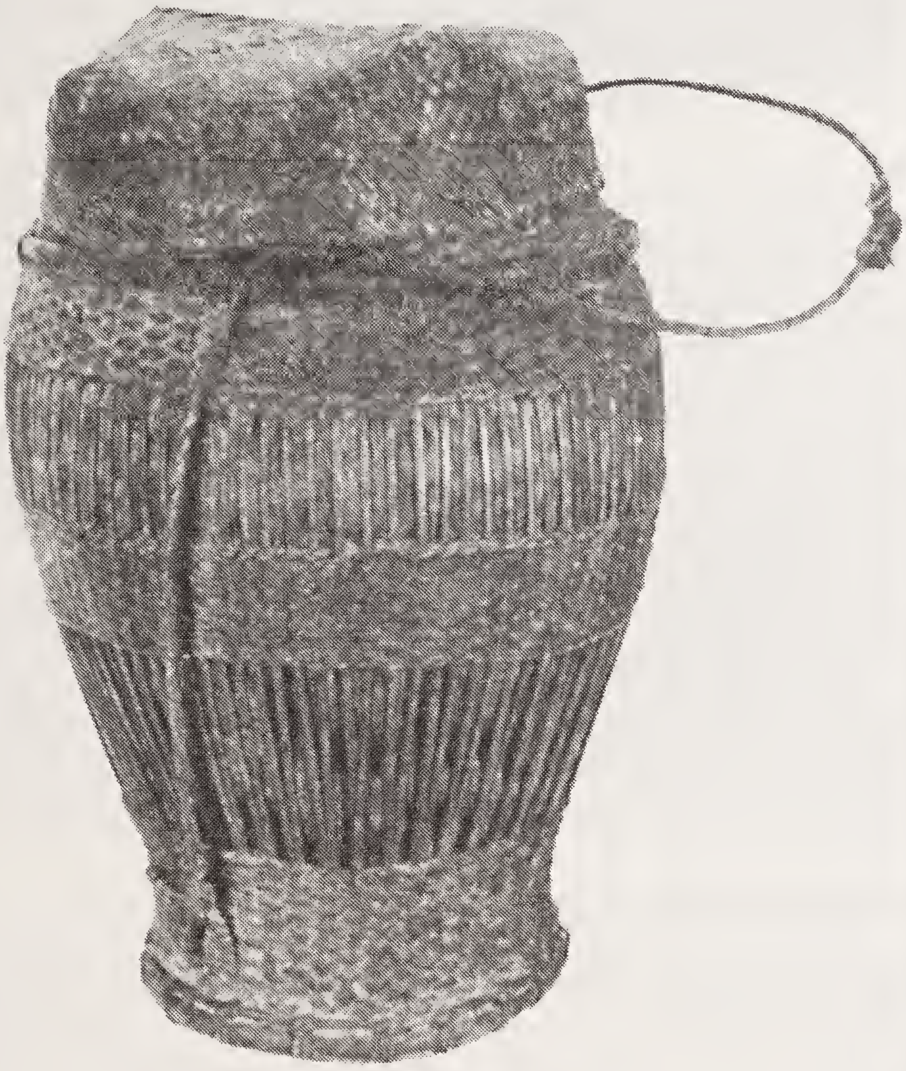

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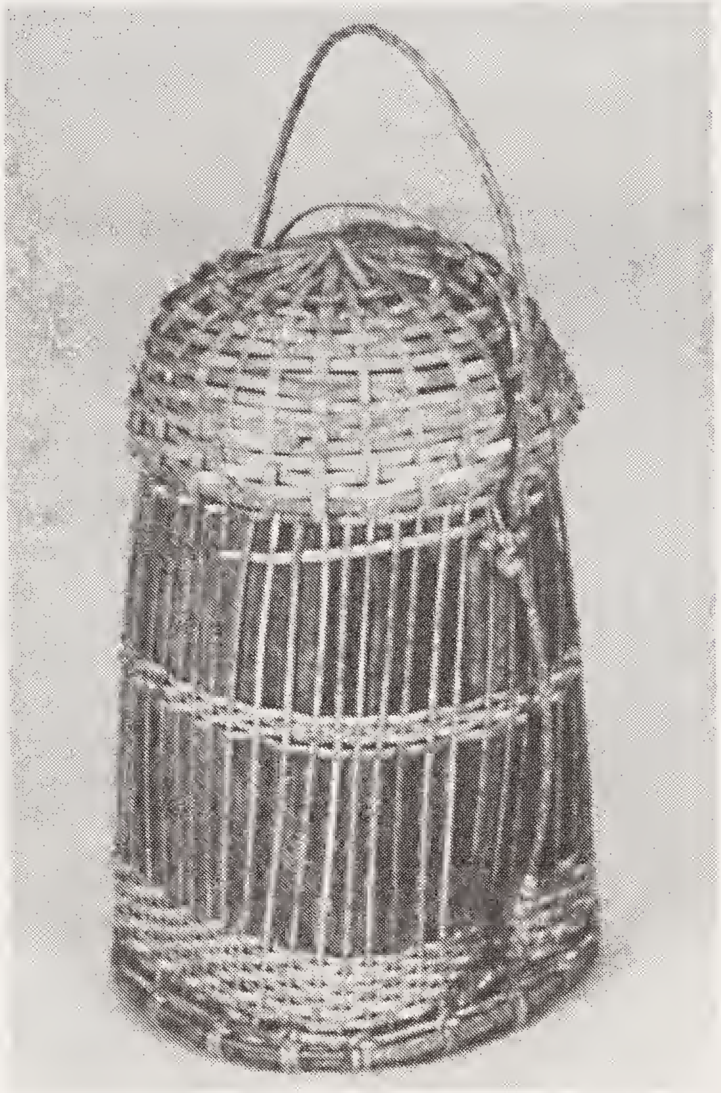

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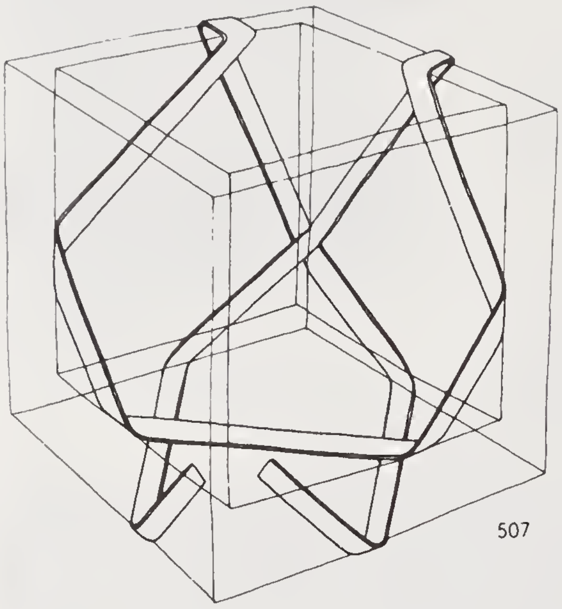
503: The *khok*, a Nocte basket used to store valuables.

504: The weave structure of the outer layer with wide bands of exposed warp elements.

505: The *khokoha*, a smaller double-walled Nocte basket.

At the bottom a false base woven from split bamboo is attached, by binding the rim of the false base and the bottom edges of the two side layers. All three layers are sandwiched between cane-strengthening elements and bound by split-cane binding. The upper rim is finished by a braided strap folded over the upper edge so that its width covers both layers and the top edge, while its length passes around the circumference of the rim. This braided strap is stitched to the rim through both layers by a length of split-cane. The lid of this basket is woven from bamboo splits, using the diagonal-weaving method. It has a square top and the short sides form a circular self-strengthened rim. The handle is in the form of a circular braided strap, with its ends attached to both sides of the container.

The *khokoha* is a smaller basket used by the Nocte tribe and it has a similar double-walled construction. The inner layer of this basket is, however, woven in the diagonal-weaving method. Hence it has a square base (fig. 505).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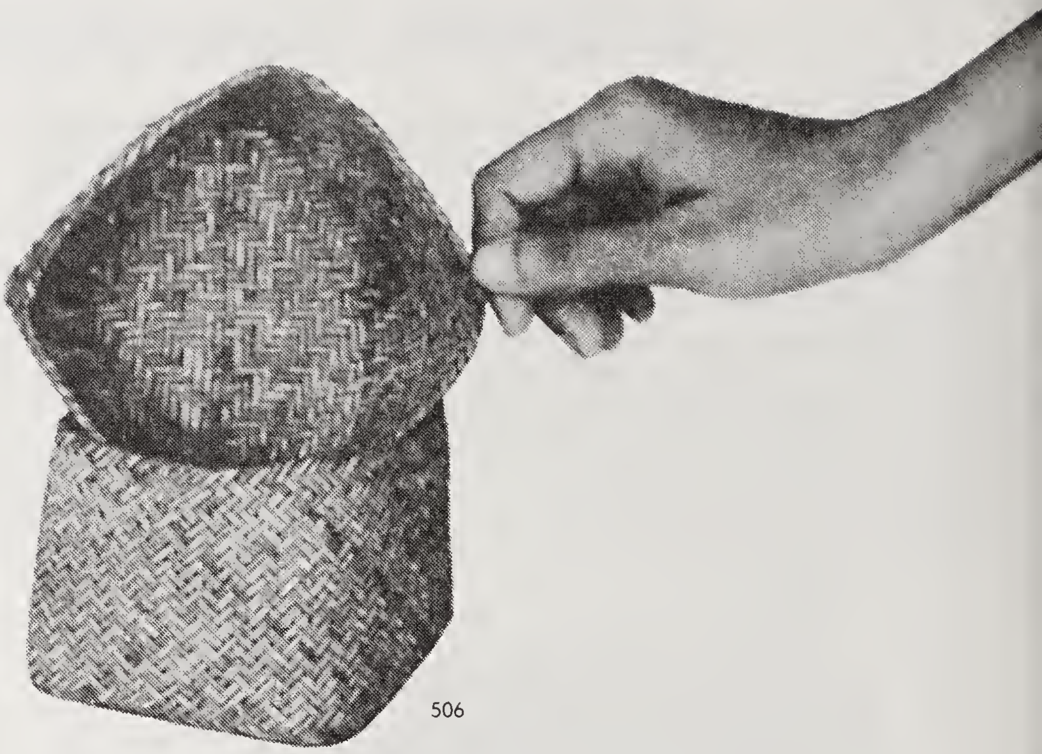
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506: The *sempa*, a cube shaped Monpa basket.

507: A schematic diagram showing the movement of a single element forming the double wall of the *sempa*.

Sempa

The *sempa* is a small cube-shaped basket with sides measuring 85 mm and is woven from cane splits. It is used by the Monpa tribe to store valuables (fig. 506).

Double-wall Structure

Both lid and container are formed by an identical weave structure, using the diagonal-weaving method to have a double layer (fig. 507). The inner layer is woven first, with the splits of cane taken diagonal to the base square, before weaving up the side as two inclined and interlacing sets. At the rim, both sets are bent sharply over the edge and continue to interlace, forming a second layer which overlaps the sides and base of the inner layer completely. The loose ends of both sets of elements are cleverly concealed by being tucked into the weave structure. In the square base of both layers of both lid and container, the twill weave used creates a pattern of concentric squares.

Small Khasi Storage Baskets

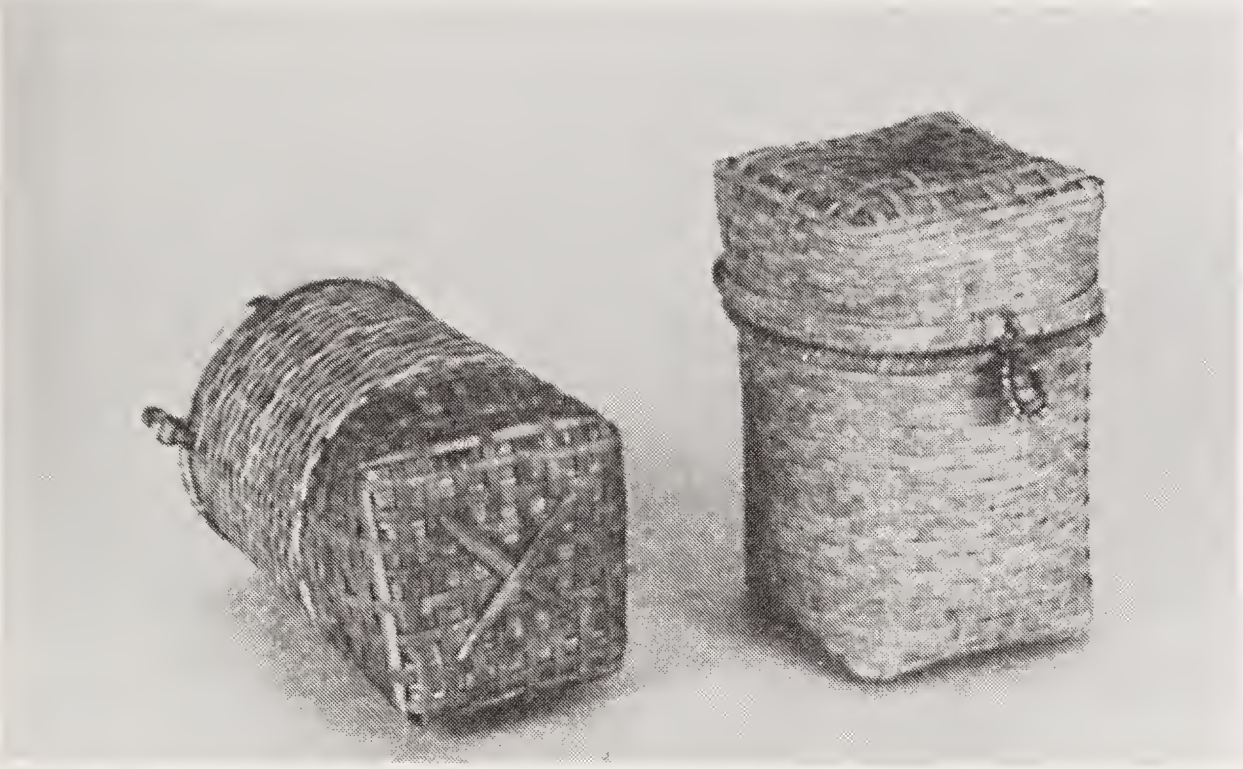
The Khasi tribe of Meghalaya use small double-walled baskets to store valuables and other small articles.

Shape and Structure

These baskets have a square base with the sides moving up vertically to end in a circular rim. The inner layer is woven with wide bamboo inner splits while the outer layer uses thin bamboo outer splits (fig. 508). In both layers the warp elements interlace to form the square base. The inner layer has a two-up-two-down twill structure while the outer layer has a tabby structure. In both layers, an extra-warp element is introduced at one corner to pass along the edge of the base square, parallel to one of the warp sets, and on reaching the other corner, this element is bent, to pass around the perimeter of the base square, becoming the spiralling weft element that moves up around the sides of the basket (fig. 509).

Rim and Other Details

Both layers are held firmly together by a strengthened rim which is sandwiched between two rings of wide bamboo splits and held together by split-cane binding. The split-cane binding element is wrapped around a third



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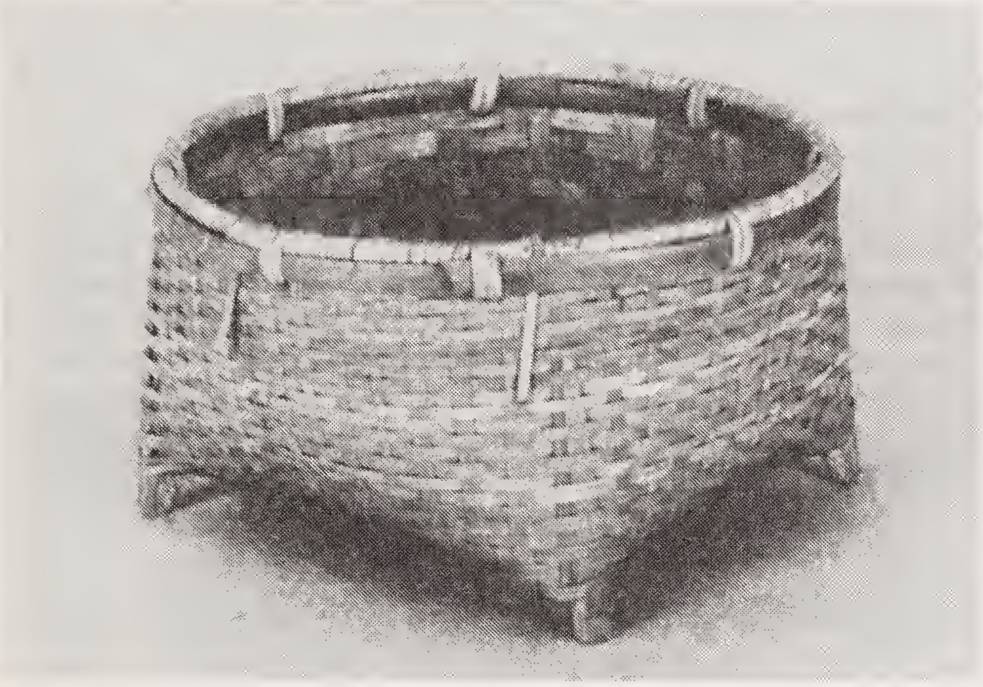
508: Small Khasi storage baskets.

509: A flattened view of the base and side weave of the outer layer of the basket.

510: A wide shallow basket used by the Khasis.



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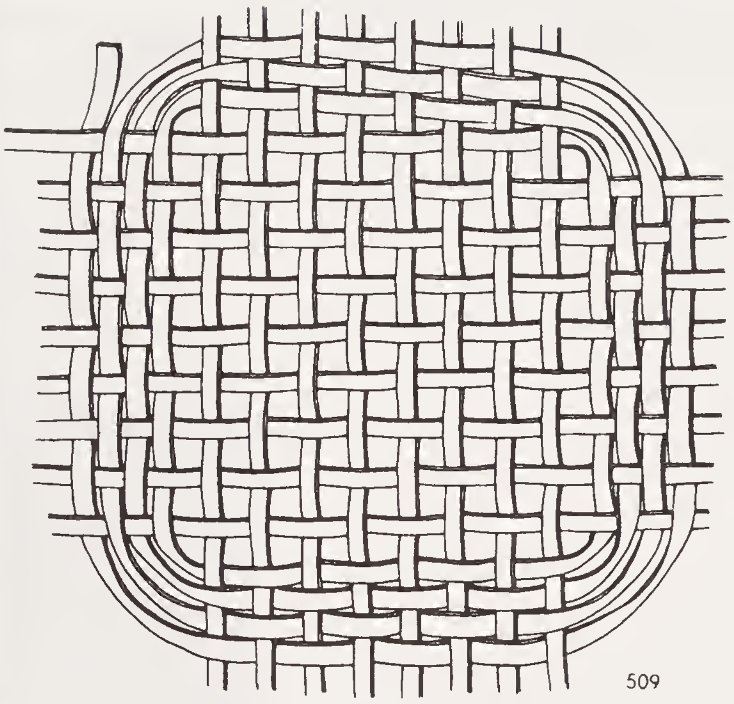

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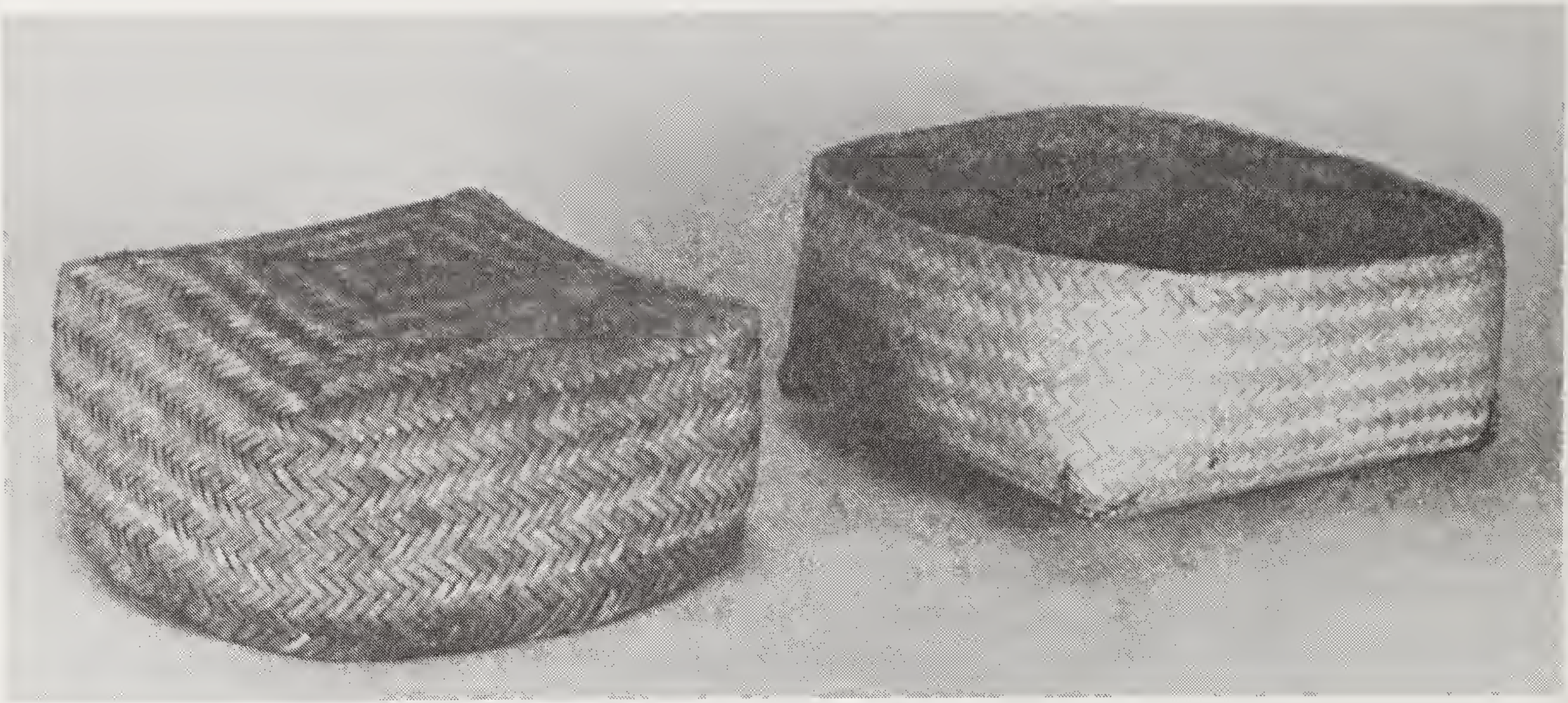
ring located at the top edge of the basket. It passes around the two sandwiching elements as well as through both woven layers at periodic intervals. The base is strengthened by two thick splints of bamboo inserted into the weave to form the diagonals of the base square. These splints pass through both layers at the base, stitching these layers together.

Some of these baskets are left open at the top, while others are provided with lids woven in the same structure as the container and hinged to the side by loops of split-cane. Three samples of this type were acquired. One with a lid has a base square of diagonal 130 mm and is 175 mm in height. The diameter of the circular rim of the container part measures 115 mm. The second basket is similar and has a square base of diagonal 125 mm, a rim diameter of 115 mm and is 175 mm in height. This product does not have a lid but is provided with a loop of split-cane at the rim so that it can be suspended, either from the waist while being carried or from a hook when stored.

The third basket is wide but shallow (fig. 510). The diagonal of the base square measures 220 mm, the rim diameter is 210 mm and its height is 120 mm. This basket is provided with legs made from spike-shaped splints of bamboo, using a part of the node at the lower end of the leg. Four of these are inserted into the side weave at the corners of the basket.



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511: A couple of *fawngs*, Lushai storage baskets.

Fawng

The *fawng* is a shallow, square-based basket with a self-strengthened square rim and is used by the Lushai tribe of Mizoram (fig. 511).

Size and Structure

The diagonal of both base square and rim square measures 400 mm and the height of the basket is 160 mm. The basket is woven in the diagonal-weaving method with two mutually perpendicular sets of elements interlacing in either a two-up-two-down twill structure or a three-up-three-down twill structure. The first twill structure is locally known as *bawthah* while the second is *thumbawh.*

Base and Side Weave

Both structures result in a pattern of concentric squares, appearing in the base square (fig. 512). Each set of elements is parallel to the respective diagonals of the base square. Both sets are bent up around the edges of the square base to pass over the sides inclined in opposite directions and continue to interlace in the twill pattern of the base. All elements are made of wide bamboo outer splits.

The craftsman starts by interlacing two pairs of splits, which form the diagonals of the base square. In these the smooth outer surface of the splits faces the outer surface of the basket. These two pairs cross and interlace to form the centre of the base square while other elements are added around this centre in a cyclic order. The number of additional elements used will determine the size of the base square. All these additional elements have their smooth outer skin facing the inside of the basket. Hence the elements forming the diagonals of the base square are clearly differentiated from the rest and these help control the pattern of concentric squares while weaving the base.

Rim

At the rim both sets of inclined elements emerge from the side weave, each set inclined in opposite directions, with one set along the inside surface and the other set along the outer surface of the rim. The outer set is first twisted, bent and tucked back into the weave on the outer surface of the basket, with these splits inclined in the opposite direction (fig. 513). The inner set is bent over the edge created by the other set, and these

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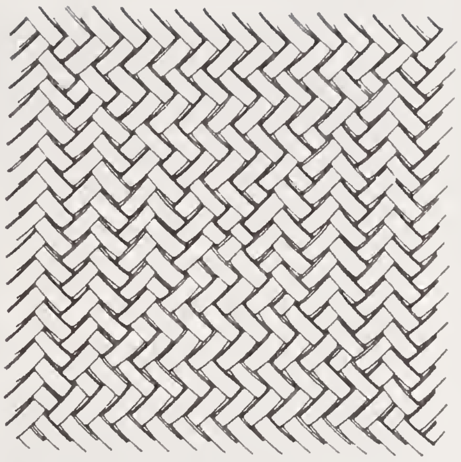

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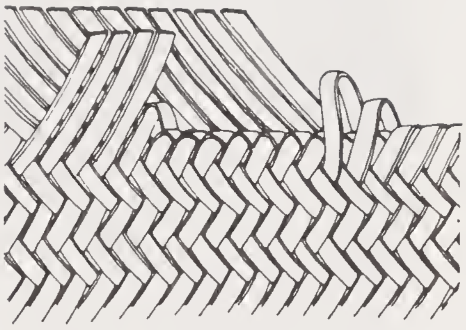


513

512: Weave structure of the base.

513: The rim is finished by folding all the elements back into the weave.

514: The corner binding sometimes used on the *fawng*.

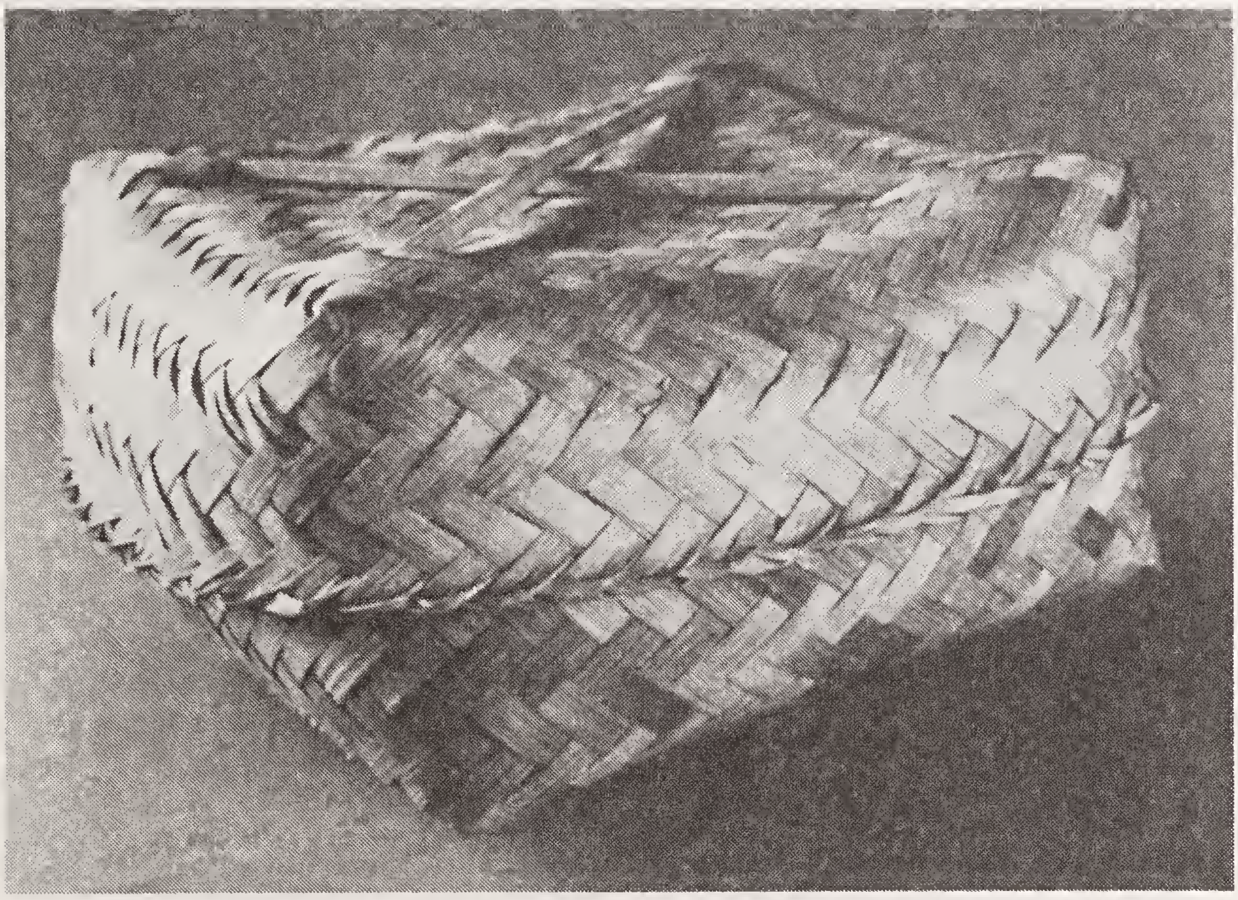
515: A small Manipuri storage basket.

too are tucked into the weave structure on the outer surface of the basket. The rim formed in this manner is strong but flexible, and all loose ends are cleverly concealed to create a smooth, well-finished edge. This structure used in the rim is locally called *thui,* hence these baskets are sometimes referred to as *fawng-thui.*

Corner Binding

The corners of the base square are in some cases strengthened by split-cane binding, similar to the ones used in Manipuri baskets. This binding detail is referred to by the Mizos as *salucher,* as a similar binding is used to decorate animal skulls that are preserved. *Salu* means "animal-head" while *cher* means "binding" (fig. 514).

Smaller baskets of a similar construction are made by the Lushais to store yarn for making the loin-loom warp. These are called *fawng-te-laivel. Fawng* refers to the square-based basket described above, while *te* means "small" and *laivel* refers to the "concentric square pattern" generated by the twill-weave structure used in the basket.



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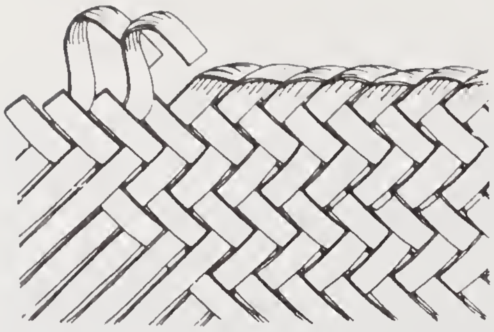
Small Storage Basket from Manipur

The Manipuris use a little box-like basket to store small objects (fig. 515). These are woven from coarse bamboo inner splits using the diagonal-weaving method.



516

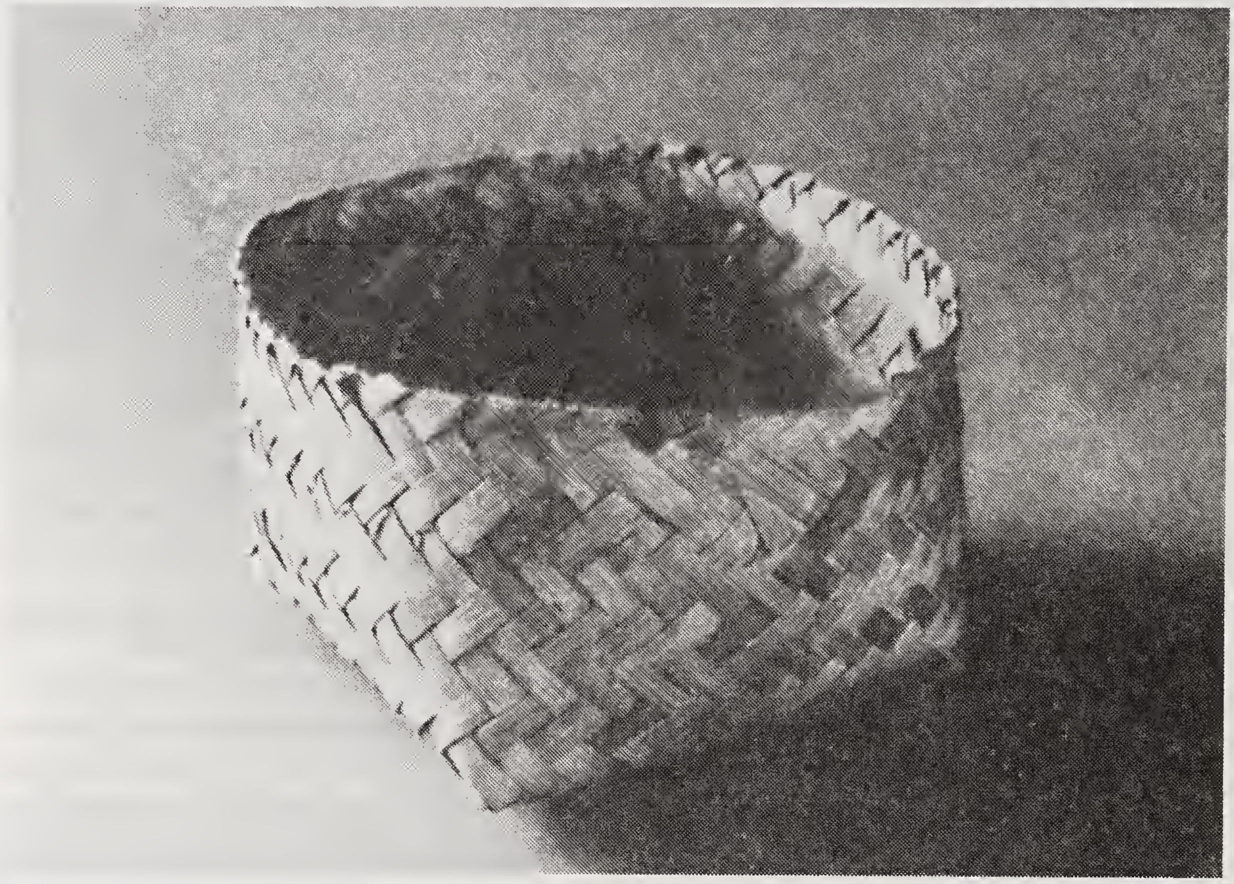
516: The rim of the Manipuri basket is finished by cutting one set of elements, and folding the other set back into the weave.

517: The *sempa khari.*

518: The *kom*, a Monpa basket.

Size and Structure

The basket has a square base of diagonal 260 mm and the sides are vertical to form a square rim of the same size. The height of the container is 120 mm. The lid is constructed with an identical structure and has a slightly larger base so that it fits over the mouth of the container. The square base of both container and lid are strengthened by strong splints of bamboo inserted into the weave to form the diagonals of the base square. At the rim one set of inclined elements of the side weave is cut horizontally, while the elements of the other set are twisted and bent back to be tucked into the side weave (fig. 516).



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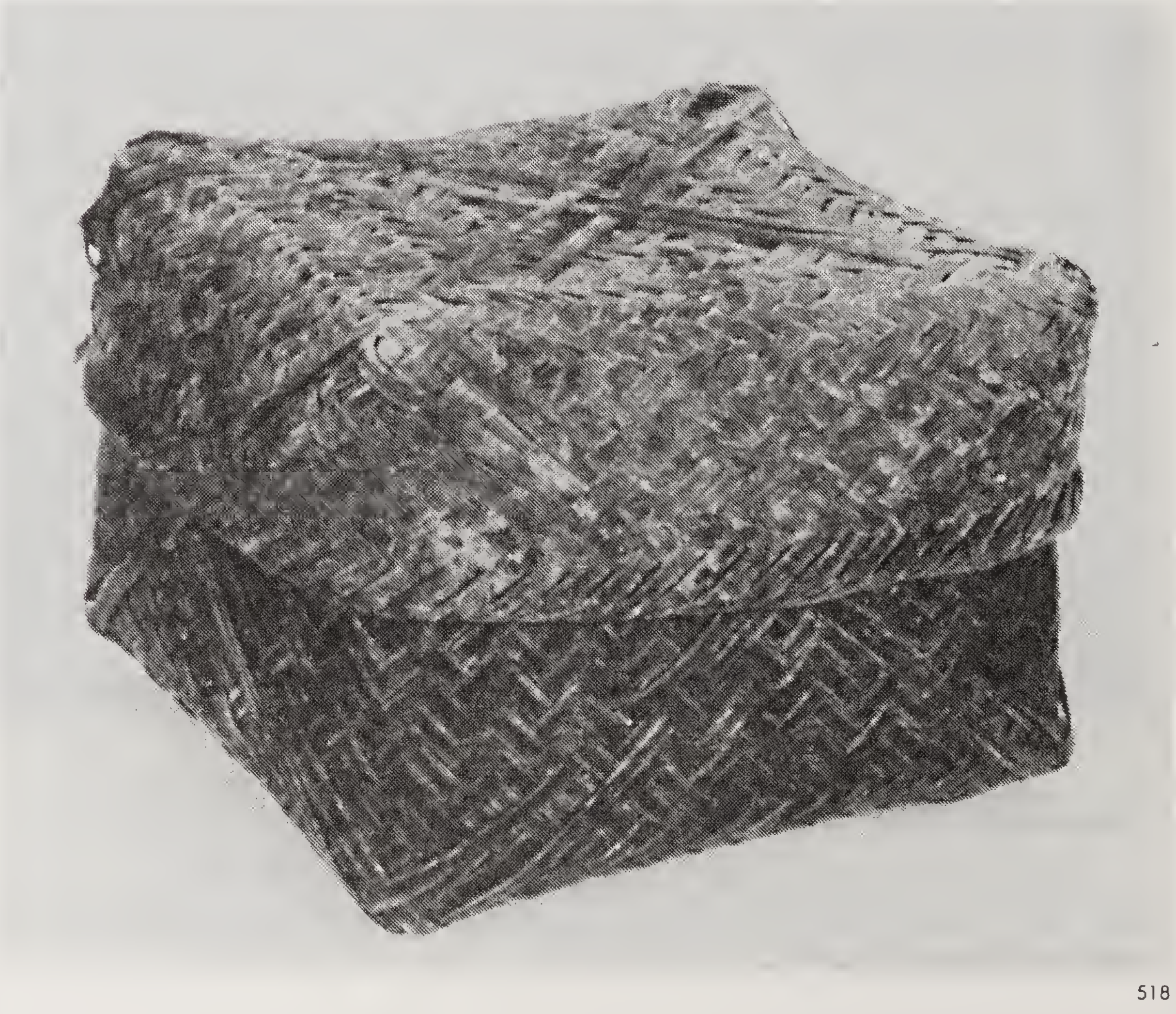

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Sempa Khari

The *sempa khari* is a small basket shaped like a square-based prism, and used by the Tripura Bengalis to store small objects (fig. 517). The basket has a square base of diagonal 160 mm with vertical sides forming a square rim. The height of this basket is 65 mm. It is woven from coarse inner splits of bamboo using the diagonal-weaving method.

Kom

The *kom* is a small storage basket shaped like a square-based prism, and provided with a lid (fig. 518). This basket is used by the Monpas and it was also seen being used by Nepali settlers at Bomdila. The basket is woven using the diagonal-weaving method and both lid and container have a double-walled structure. This weave structure and the method of weaving both layers using the same sets of elements are identical to that used in the *sempa,* which has already been described. Unlike the *sempa*, which is woven from split cane, the *kom* uses wide bamboo outer splits. The smooth outer layer of the bamboo skin appears on the outside as well as the inside of the basket. Hence the coarse inner surface of the bamboo splits is effectively concealed. Both container and lid have been smoked to give the basket a rich red-brown colour.

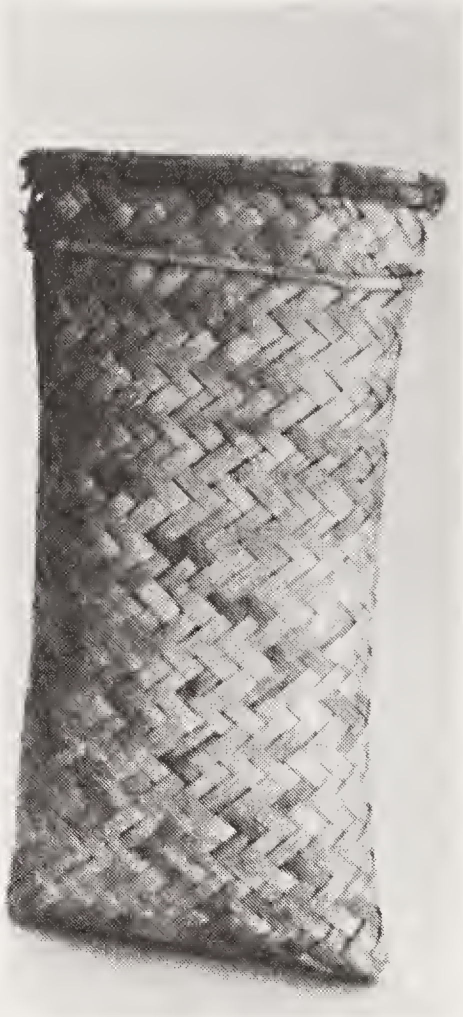
Date Basket from Tripura

This basket was acquired from Nalchar in Tripura. It is used to store dates and is carried suspended from the waist band (fig. 519). The basket is woven from coarse bamboo inner splits using the diagonal-weaving method. It is shaped like a deep rectangular pouch open at the top. The base is a straight line, from which the sides bulge out with the two sets of elements which interlace at the base, moving up the sides inclined in opposite directions.

These pass around the vertical edges on either side, before continuing up the opposite side, upto the rim (fig. 520). The rim is strengthened between rings of wide bamboo splits, bound with metal wire binding.

Bamboo-Shoot Package from Manipur

Fresh and fermented bamboo-shoots are sold at wayside shops in Tengnoupal, a town 80 kms southeast of Imphal in the hills bordering Burma. Bamboo-shoots are first carefully packed in green leaves which are



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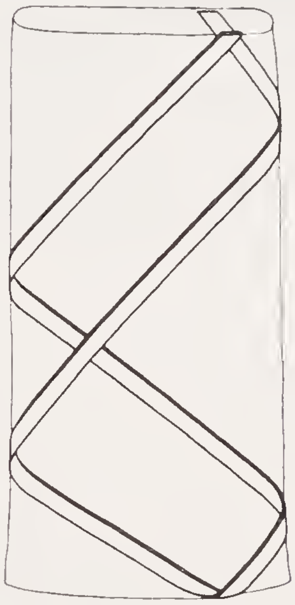

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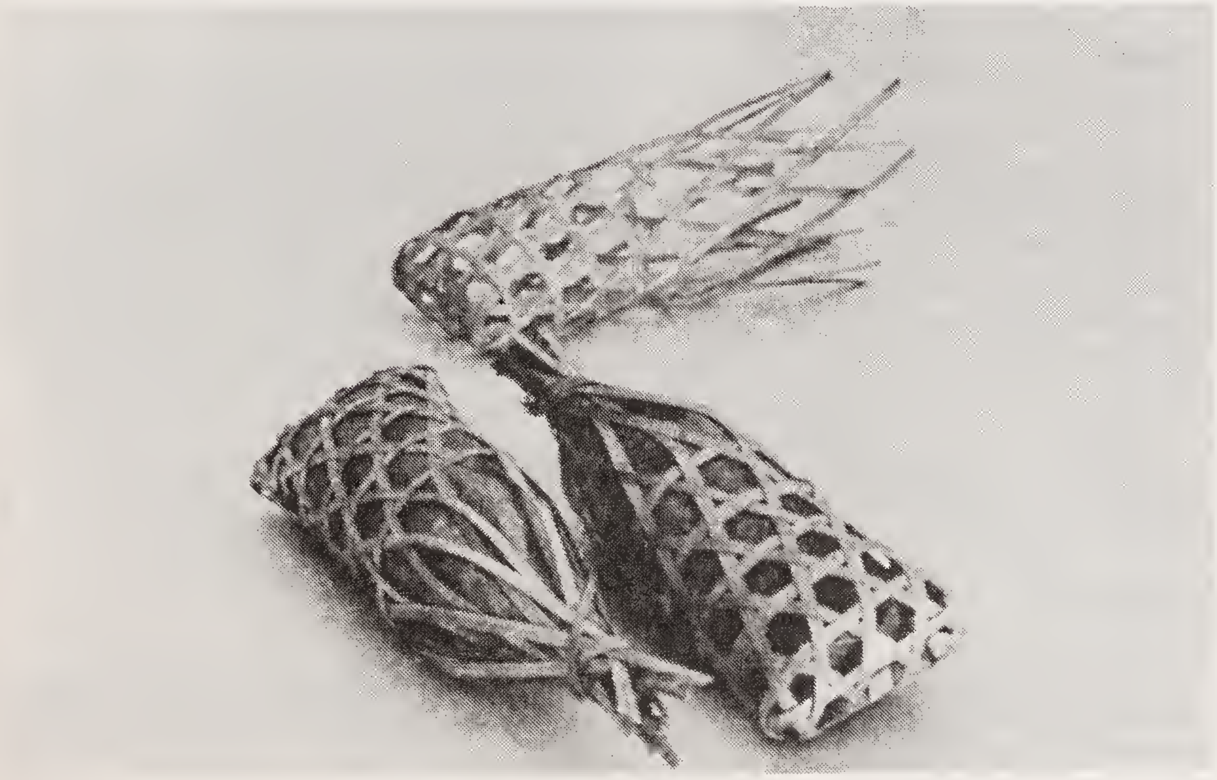


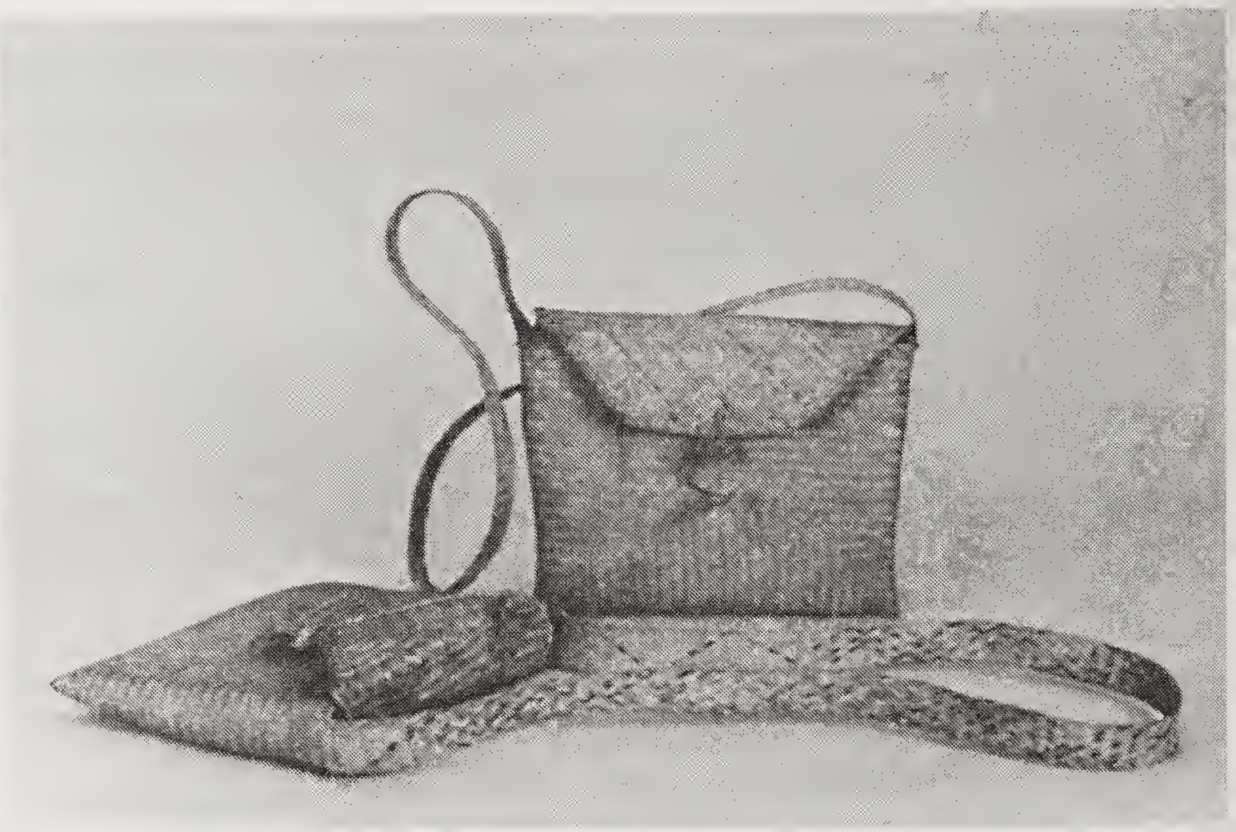
521

519: A basket from Nalchar, used to store dates.

520: A schematic diagram showing the movement of a bamboo split along the date basket. The pair to this element would move similarly in the opposite direction.

521: Bamboo packaging for bamboo shoots.

subsequently enclosed in a net of thin bamboo splits (fig. 521). This cylindrical package has a wedge-shaped base and is woven in an open-hexagonal weave. Two sets of elements pass under the base to move up the sides inclined in opposite directions, while a third element interlaces the elements of both inclined sets, while moving around the sides as a shallow spiral. At the top the inclined elements are bunched together in a swirl before being bound by a length of bamboo split. This package is 250 mm long and 75 mm in diameter.



522

522: A pair of shoulder bags from the AIHB training centre at Tuensang.

Shoulder Bags from Tuensang

Shoulder bags woven from fine splits of bamboo are contemporary products developed at the All India Handicrafts Board's training centre located at Tuensang (fig. 522). These are woven like rectangular pouches using the diagonal-weaving method. At the top, elements extending out of one of the wider sides continue to be interlaced to form a flap, while the other side is stopped and finished to form the rim. Elements extending from both the shorter sides are braided to form the shoulder strap. The ends of both braided straps are interlaced to form a simple strap and the joint is concealed.

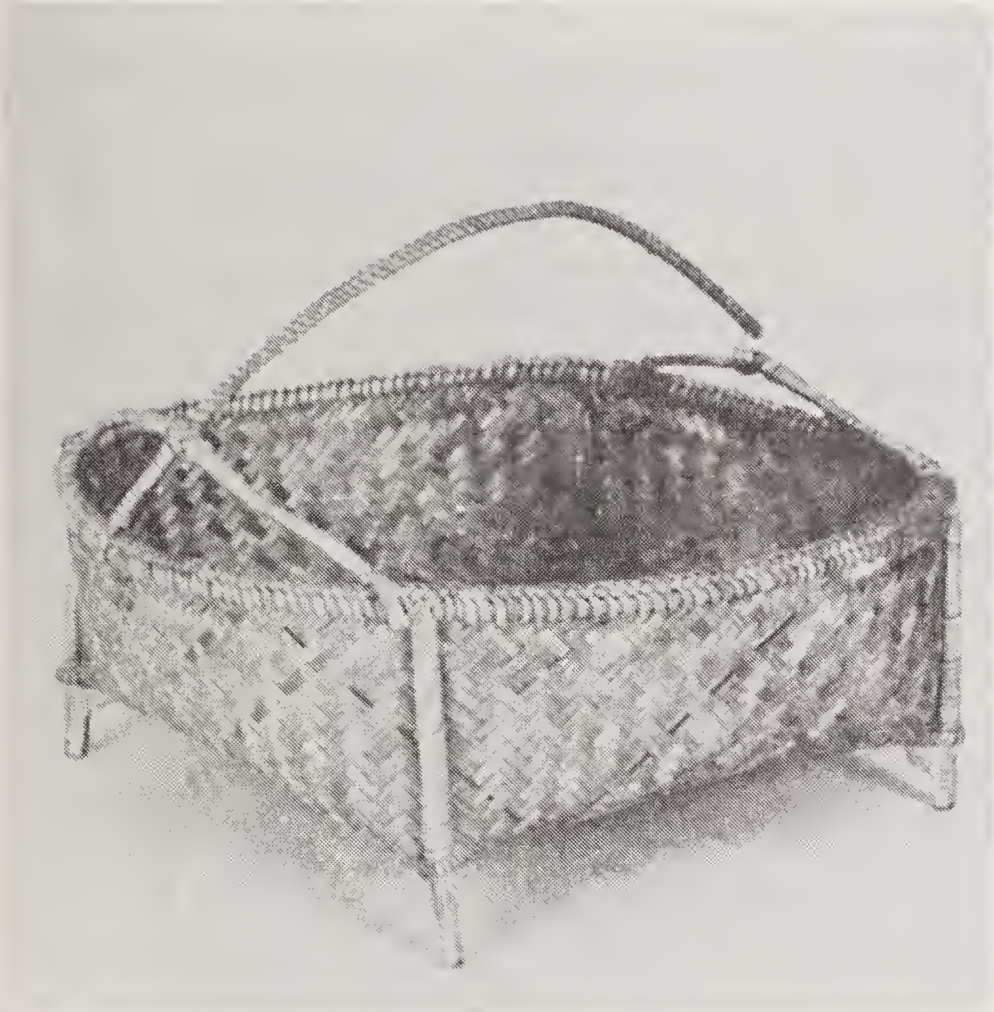
Kum

The *kum* is a small square-based basket made of bamboo splits using the diagonal-weaving method (fig. 523). It is used by the Wancho tribe of Arunachal to store *pan* leaves and *thambul,* fermented betel-nuts. This basket is used inside the house. It has four legs, each extending up to strengthen the sides. A handle made of a length of split cane is attached to opposite points on the rim to form an arch above the basket. This strip is covered with a decorative binding of split cane. A similar binding is used to hold the cane-strengthening rings at the rim.

Other small baskets, either square or rectangular-based are used to store articles needed in the house. These too have a similar handle construction (fig. 524).

Kyayong

The *kyayong* is a small rectangular-based basket woven from fine bamboo outer splits (fig. 525). This is used by the Adi Gallong tribe to carry seeds to be sown in the *jhum* fields.



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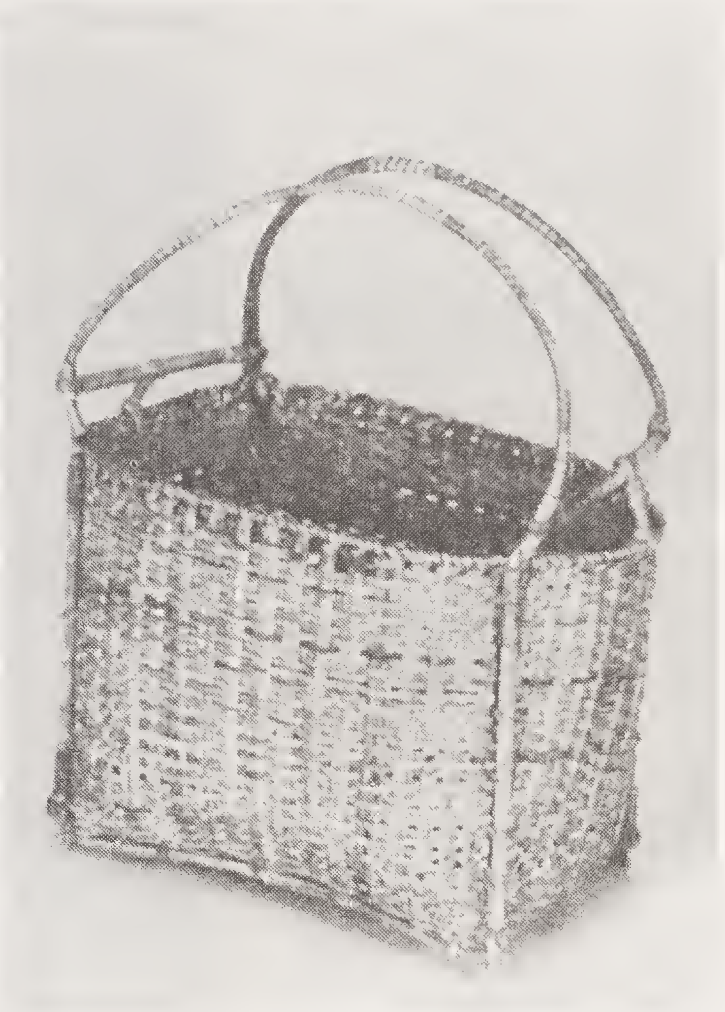

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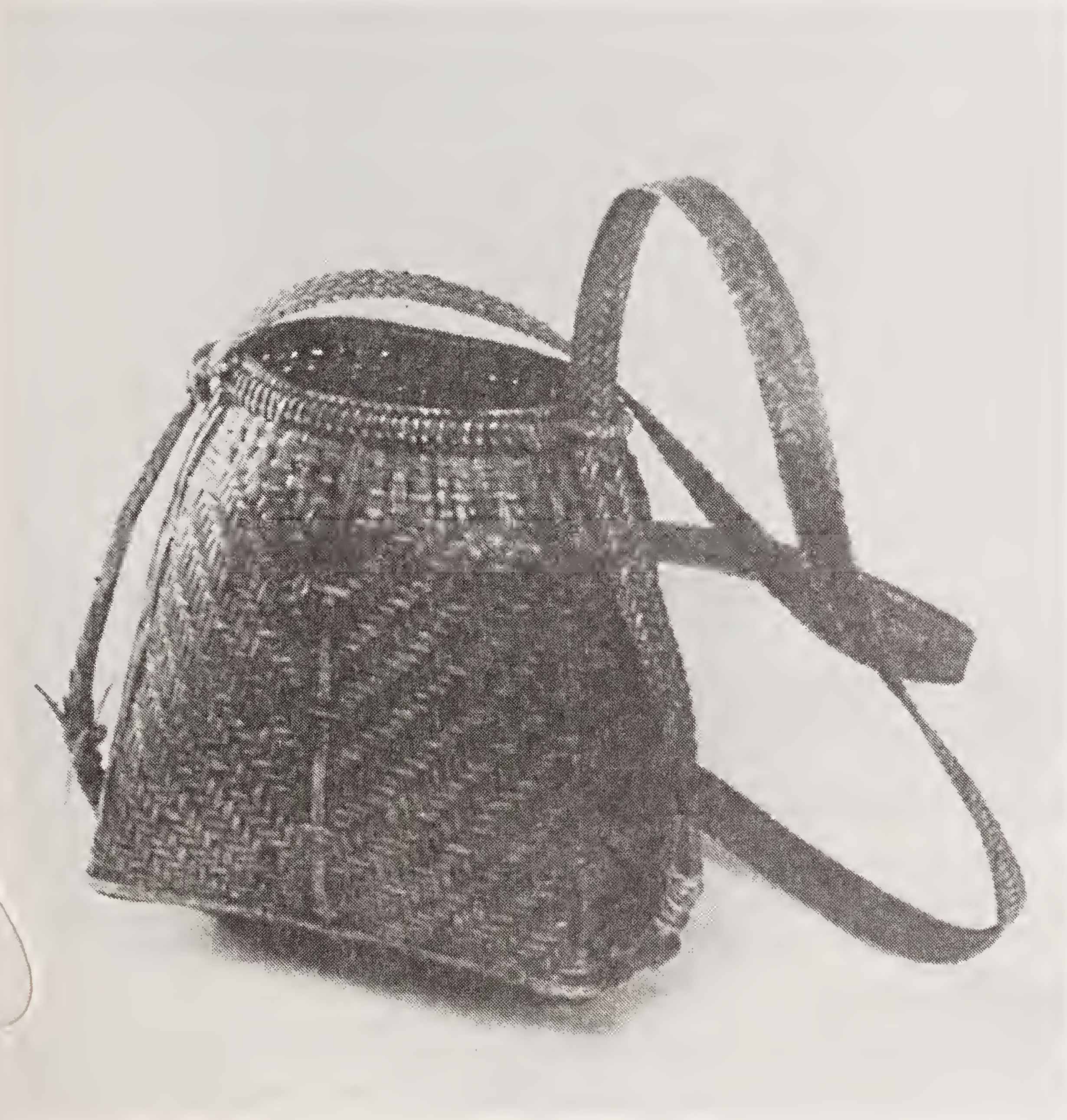
523: The *kum*, a Wancho basket used to store *pan* leaves and *thambul.*

524: Another small Wancho storage basket.

525: The *kyayong*, an Adi Gallong seed basket.



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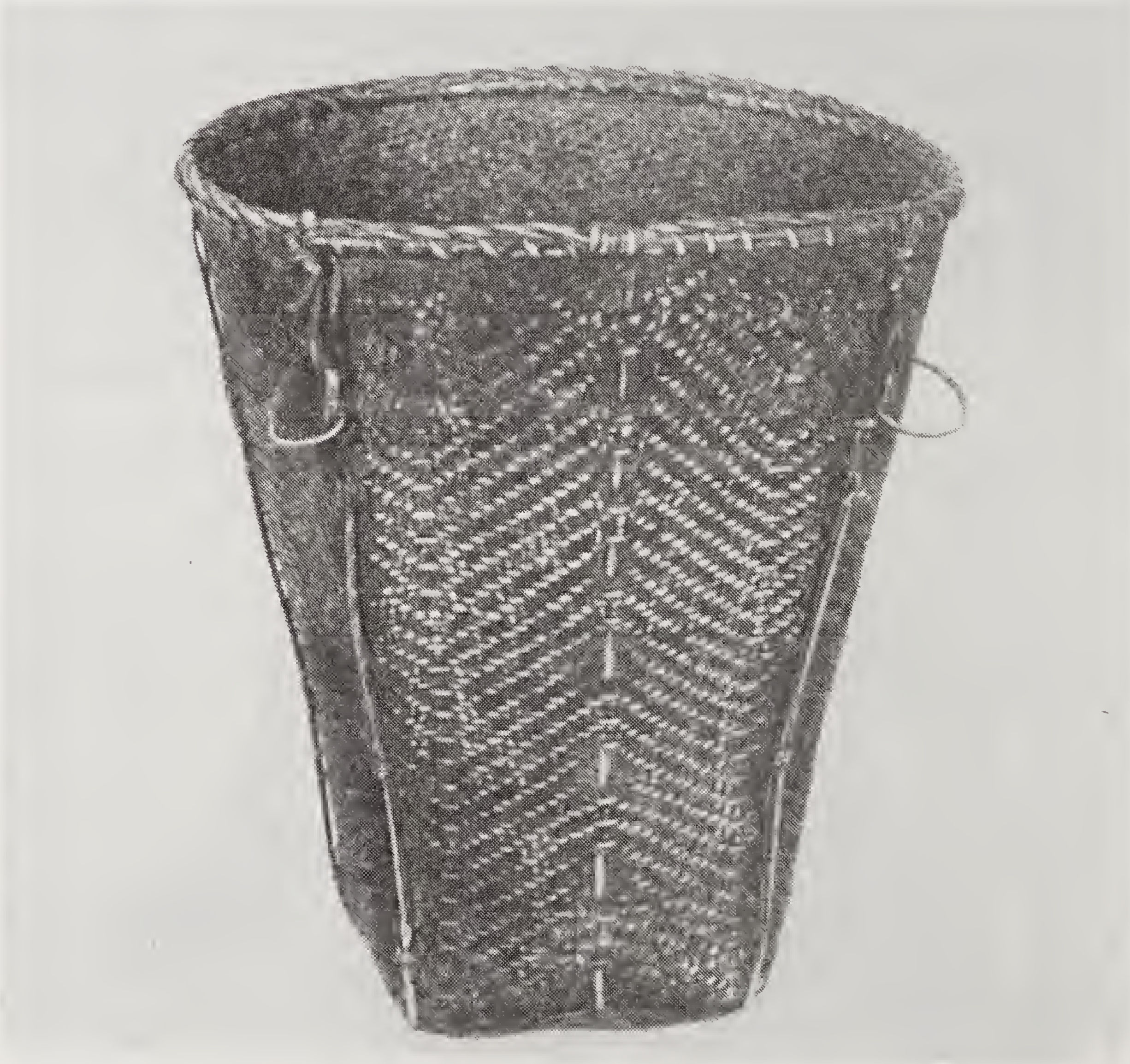
Size and Structure

The rectangular base of the basket measures 170 mm by 90 mm, and its height is 200 mm. The major axis of the elliptical rim is 120 mm and its minor axis measures 90 mm. The base and sides are woven in a herringbone-twill structure. The sides narrow down sharply to form a small elliptical rim. This narrowing down is achieved by overlapping sets of warp elements taken three at a time which are held under or over the spiralling weft element that forms the side weave.

Strengthening and Other Details

The base and sides are strengthened with split cane, introduced as extra-warp elements, interlacing the weft at regular intervals. The rim is strengthened by sandwiching the edge of the side weave between a pair of stiff rings made from split bamboo which are fixed in a decorative manner using split-cane binding. A long head-strap made of split-cane braiding is provided. At both ends the flat braiding is transformed into a tubular braiding of circular cross-section. These ends are bound together below the base of the basket after they pass through cane loops.



526

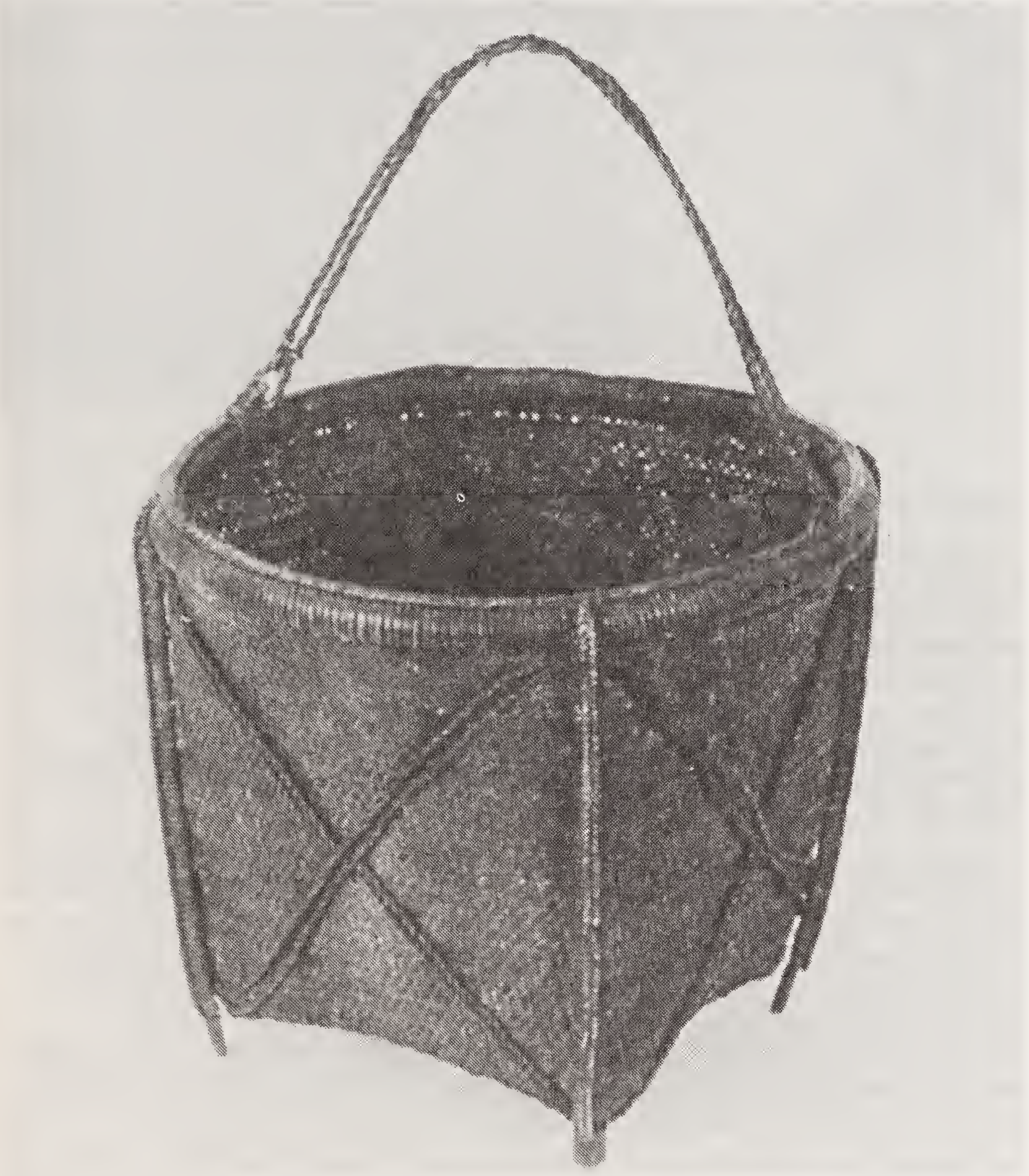
526: A seed pouch from Nokyan in Nagaland.

Seed Pouch from Nokyan

This small basket is used by the Khiamngan Naga tribe of Nokyan village located near the Burmese border in Tuensang District (fig. 526). It is used as a seed pouch and is carried with a head-strap while sowing *jhum* fields.

Size and Structure

The basket has a square base of diagonal 75 mm, a wide circular rim of diameter 170 mm, and it is 190 mm in height. It is woven using extremely fine splits of bamboo. Two sets of warp elements interlace to form the base and the sides are formed by a spiralling weft element weaving in a herringbone-twill structure. The sides and base are strengthened by split-cane elements bound to the outer surface by split-cane binding. The rim is strengthened by split-cane rings also bound by split-cane. The top edge of the rim has a pair of split-cane elements twisted together with the rim-binding element passing between twists.



527

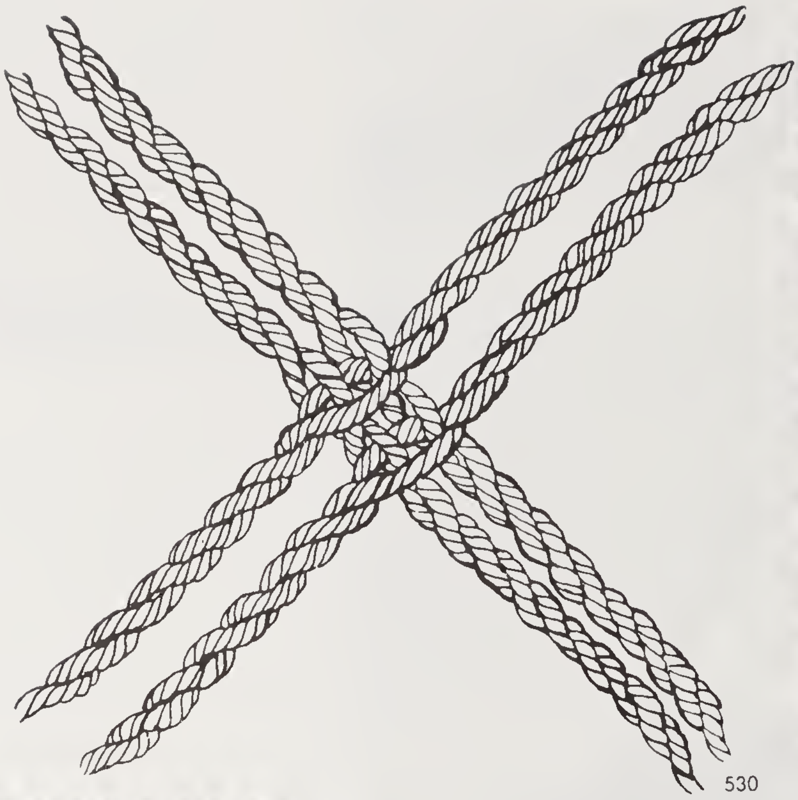
527: The *oniliya*, an Apa Tani basket used to store yarn.

Baskets for Yarn

Several tribes in the northeastern region use small baskets, woven in fine splits of either cane or bamboo, to store balls of yarn required while weaving, knitting or braiding. These baskets are light and are finished sensitively, with an extremely fine structure so that the yarn does not get entangled or damaged by sharp protrusions. They have a wide rim and normally a flexible strap or handle.

Oniliya

The *oniliya* is used by the Apa Tani tribe of Arunachal to store the required quantity of yarn used while weaving on their loin-looms. The basket has a square base of diagonal 160 mm from which the sides move up to form a circular rim of diameter 190 mm. The height of the basket is 160 mm (fig. 527).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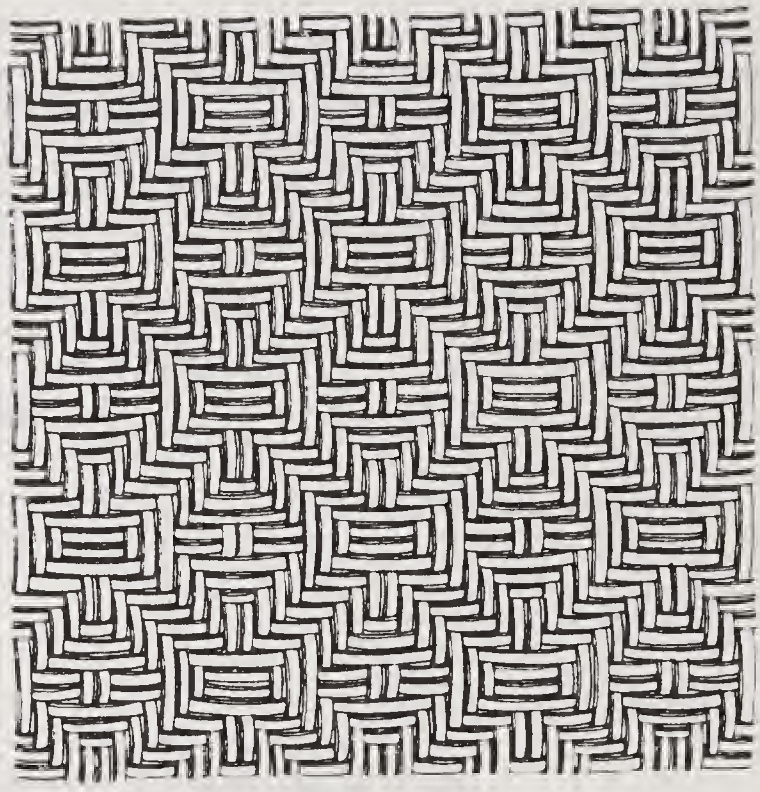
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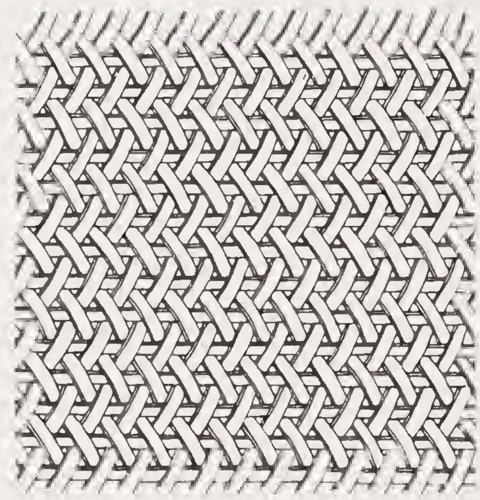
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528: The side weave structure.

529: The decorative base weave.

530: The twisted strands of the ropes interlaced as they cross.

Weave Structure

The base and sides of the basket are woven in a variation of the open-hexagonal weave which results in a closed-weave structure. This variation of the open-hexagonal weave structure is generated when all three diagonals of the hexagons are filled in by a set of three elements interlacing in a specific way. However in the process of weaving, the completed structure, in its final weave form, emerges as the side weave progresses. This process is quite different from other similar structures, where the open-hexagonal structure is first completed before the diagonals are inserted to fill the open spaces.

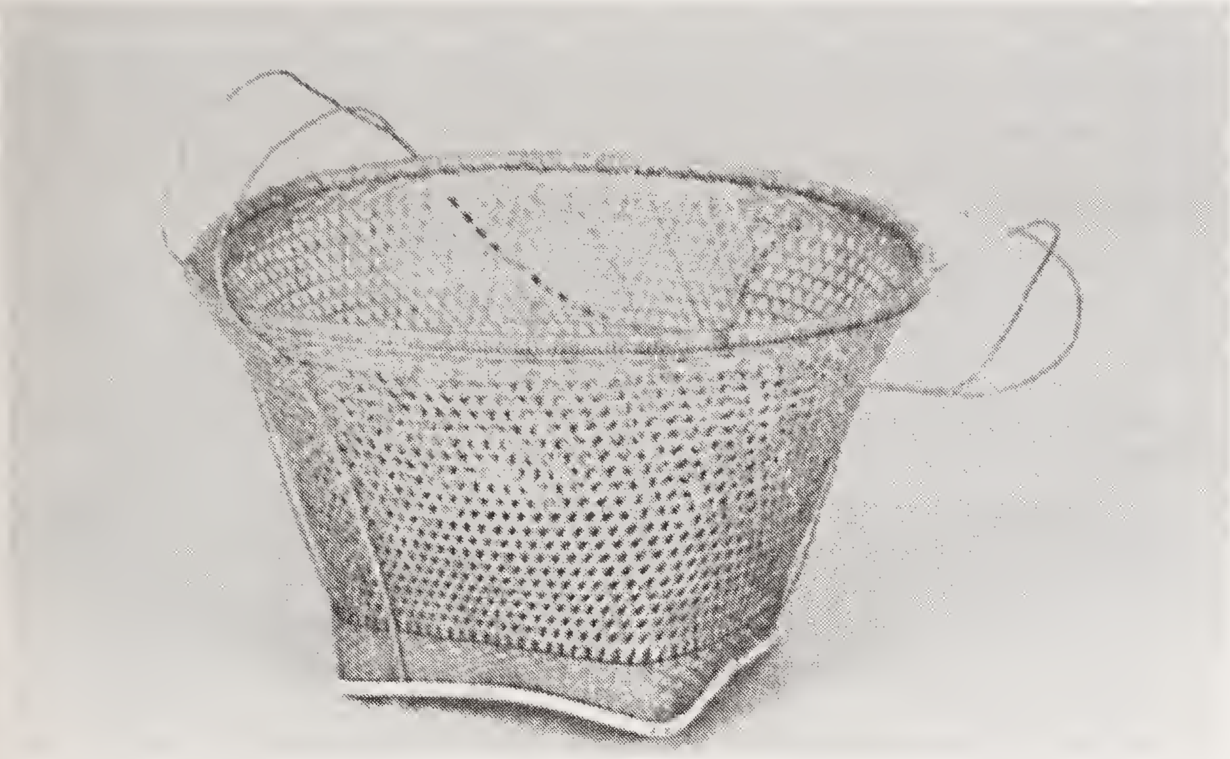
Hence in the *oniliya* one module of the side weave structure is generated by two parallel sets of inclined elements, with each set inclined in opposite directions. These elements form the warp. The warp is interlaced by a pair of weft elements moving in a double start spiral around the basket. In each turn of the spiral, the first weft element passes over all elements inclined to the right and under all elements inclined to the left. The second weft element which runs parallel to and above the first interweaves both inclined sets in a manner similar to the first weft, but the order in which it interlaces the warp elements is reversed (fig. 528).

Base Weave

In the square base, all the warp elements of the side weave interlace, with these forming two mutually perpendicular sets parallel to the sides of the base square (fig. 529). The weave structure used is a figured twill which forms a repeating rhombic pattern. Around the perimeter of the base square, groups of warp elements, extending from all four sides of the base, are held between twists by a pair of split-cane elements, twisted to form a fibrous rope.

Construction Details

The sides of the basket are strengthened by four thick splits of bamboo running vertically up to the rim and located at the corners of the base. A short length of this split extends below the base to form the legs. These splits are wrapped by a decorative split-cane binding which intermittently locks into the side weave. The sides are strengthened by two pairs of cane ropes, twisted from split-cane elements, each pair forming one diagonal of a side before passing over the other sides in a similar manner. At the point where these ropes cross, both pairs are interlaced by one of the strands of each



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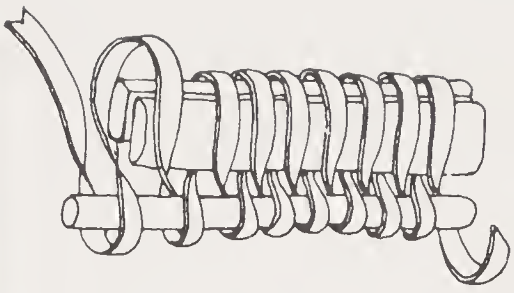

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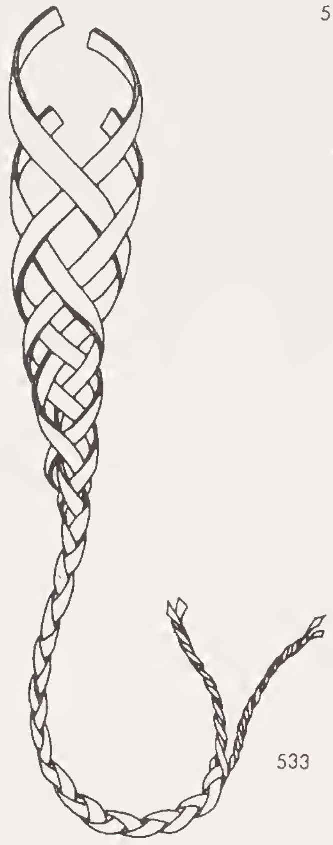

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531: The yarn basket from Noklak.

532: Detail of the rim binding.

533: The construction of the tubular braided handle.

rope passing between the twisted strands of the other (fig. 530). The rim of the basket is finished with a decorative binding detail of split cane. A handle of twisted cane rope is attached to loops at the rim.

In one example of the *oniliya,* in the collection at Hopoli Museum, a few splits in the side weave are dyed a deep red colour using the Apa Tani technology of vegetable dyeing normally used for their waist band.

Yarn Basket from Noklak

This basket is woven from extremely fine splits of bamboo and is used to store yarn for weaving (fig. 531). It was acquired from Noklak village in Tuensang District of Nagaland.

Size and Structure

The basket has a square base of diagonal 130 mm and the sides flare out to a circular rim of diameter 190 mm. The height of the basket is 120 mm. The base weave is formed by two interlacing sets of elements, each consisting of two splits of bamboo with each set parallel to the sides of the base square. A two-up-two-down twill structure is used and a small gap is kept between consecutive elements of each interlacing set. The base is strengthened by bamboo splints inserted into the weave to form the diagonals of the base square. The perimeter is strengthened by a thick split of cane wrapped around by a strip of white coloured plastic which binds intermittently into the weave structure.

Side Weave

The elements extending out of the base are bent up and a single spiralling weft element interlaces these in a tabby structure, which forms a narrow border near the base. Above this the open-hexagonal weave is used where each warp element of the tabby structure provides two warp elements for the open-hexagonal weave, each inclined in opposite directions. These inclined sets are interlaced by the spiralling weft element. At the point of transition between the tabby and open-hexagonal structures, the warp elements are held between consecutive twists of a pair of fine fibres extracted from a locally available palm tree.

Rim

Near the rim, the tabby structure is once again used to form a narrow border before the edge is sandwiched between rings made from fine bamboo splits. These splits are wrapped around with a fine split of bamboo which knots around a third ring located below the sandwiching elements on the outer surface of the basket (fig. 532). This split-bamboo binding covers the rim completely and holds the strengthening rings firmly to the edge of the weave structure.

Braided Handle

A handle made from fine split bamboo strips is braided with a tubular structure (fig. 533). Bamboo splits extending from both ends of the braided part are twisted to form a pair of fibrous ropes on each side. These ropes pass through loops, two each on either side of the basket, before being knotted below the base. This handle looks delicate, but is in fact extremely strong.

The basket is elegant in construction with extremely fine splits of bamboo combined in a sensitive manner. The only jarring note is the use of the white plastic strip in the binding around the base. This represents a recent trend seen in the basketry craft, growing with the increasing external influence due to improved communications and exposure to the products of an alien technology.

Kohima

The *kohima* is a small basket used by the Monpa tribe of Arunachal to store balls of wool used for knitting (figs. 534, 535). The basket was seen in use at Lish village near Bomdila. It is hung from the left arm which is bent at the elbow, leaving both hands free to knit. Women continue knitting during their long walks to and from the fields.

Size and Shape

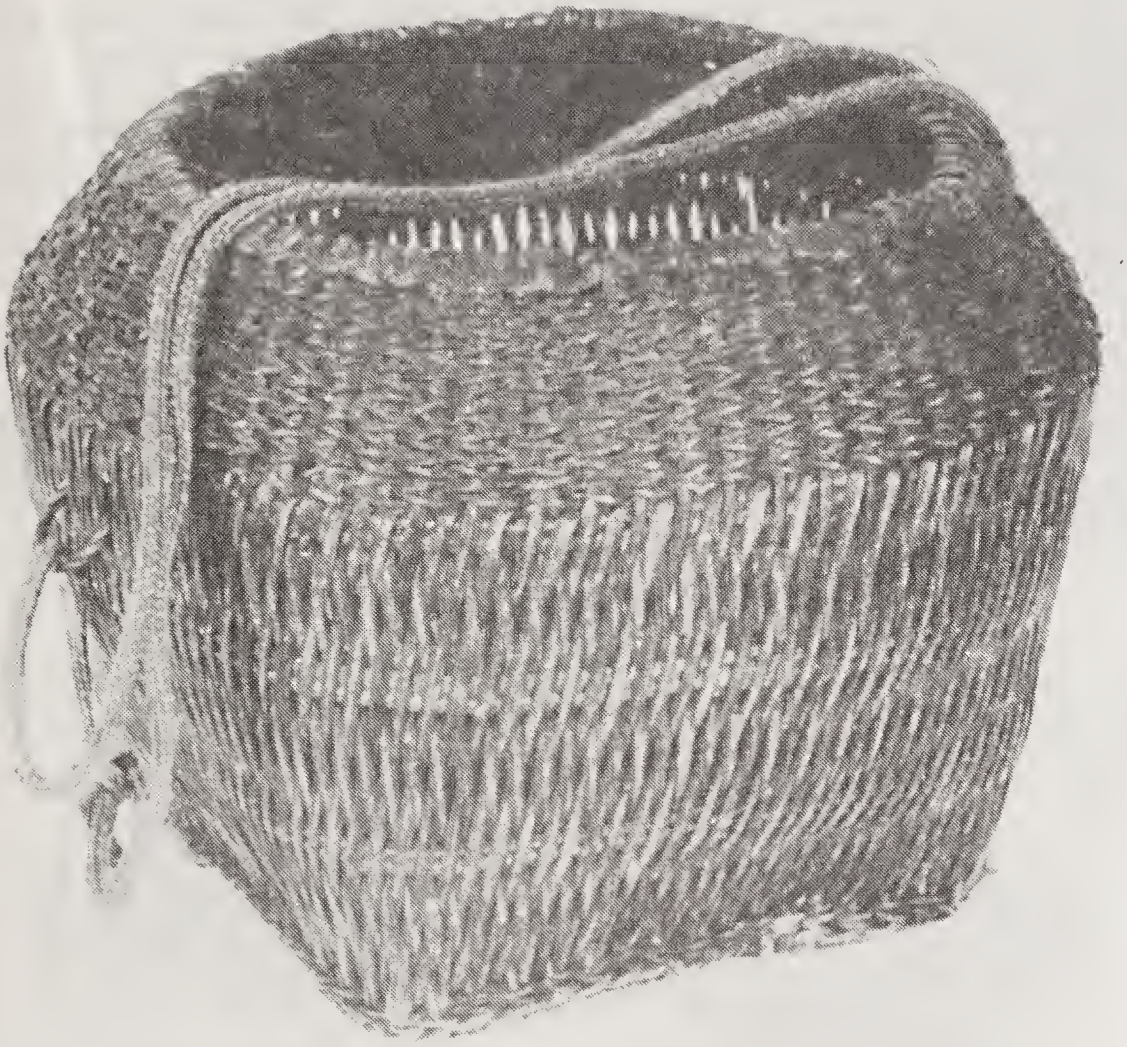
This basket, like other Monpa bamboo baskets, is made from bamboo splits taken from a thin-walled, thin-stemmed bamboo. The basket has a square base and the sides stretch outwards for much of its height before curving in sharply to form a circular mouth at the top. The diagonal of the base square measures 170 mm. The maximum diameter of the basket is 210 mm while the diameter at the rim is 150 mm. The height is 150 mm. The basket has a typical Monpa construction, similar to that used for their large closed-weave carrying basket.

Base, Side and Rim

The sides of the *kohima* are woven in a variation of the open-hexagonal weave which results in a fairly closed structure (fig. 536). The inclined elements of the hexagonal weave of the side interlace in the base as two mutually perpendicular sets, each parallel to the sides of the square base. The weave structure of the base is a two-up-two-down twill with each weave element formed by a pair of splits. Around the perimeter of the base square, these pairs are held between consecutive twists of a pair of splits which form a fibrous rope. Elements extending beyond the square are bent up to form the inclined elements of the open-hexagonal weave in the side and these are interlaced by a weft composed of two splits of bamboo taken together. The hexagons formed are elongated in the vertical axis.

Three rows of hexagons are formed before pairs of inclined elements are held between a different weft structure which forms a narrow border below the rim. Here each weft element is a pair of twisted strands of split bamboo which forms a rope and this holds each pair of warp elements between consecutive twists. Several rows of this structure are repeated and in alternate rows the weft rope is twisted in opposite directions.

The rim at the mouth of the basket is self-strengthened. Here the warp elements taken in pairs are bent to form a looped knot and the remaining length of the warp lies along the circumference of the rim forming the core of the thickened rim. This core is held within looped knots of subsequent warp elements.

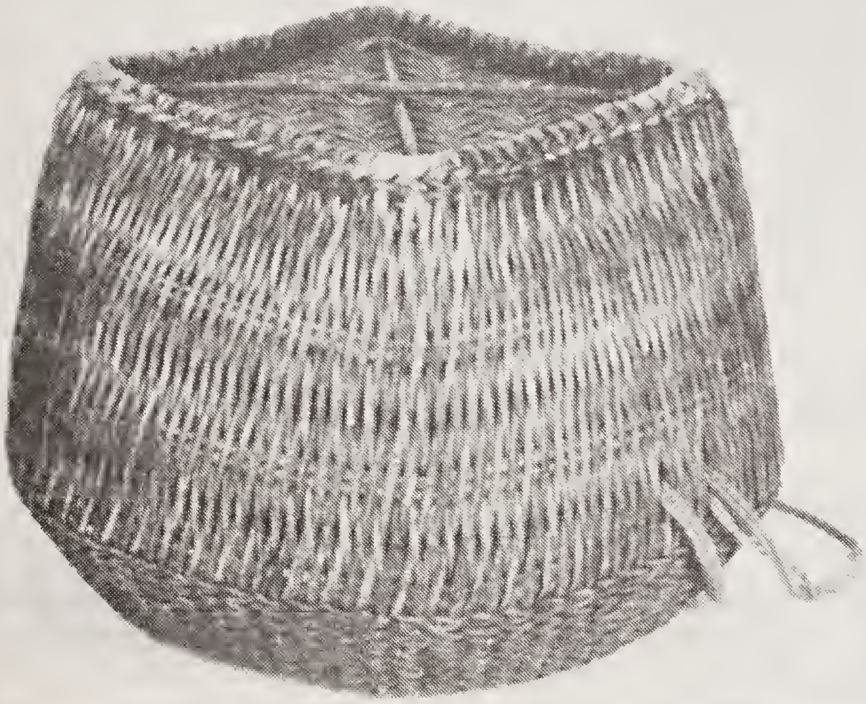


534: The *kohima*, a Monpa basket for yarn.

535: Detail of base structure.

536: A flattened view of the structure of the base, the strengthening at the edge of the base, the side weave and the rim of the *kohima*.

534



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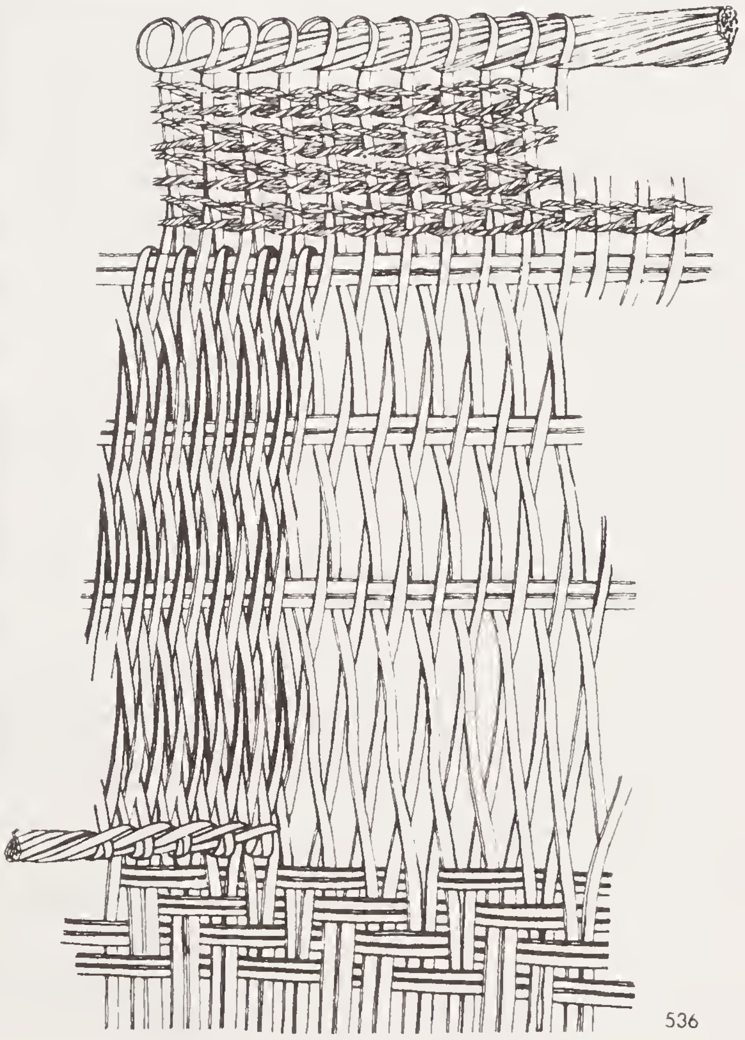

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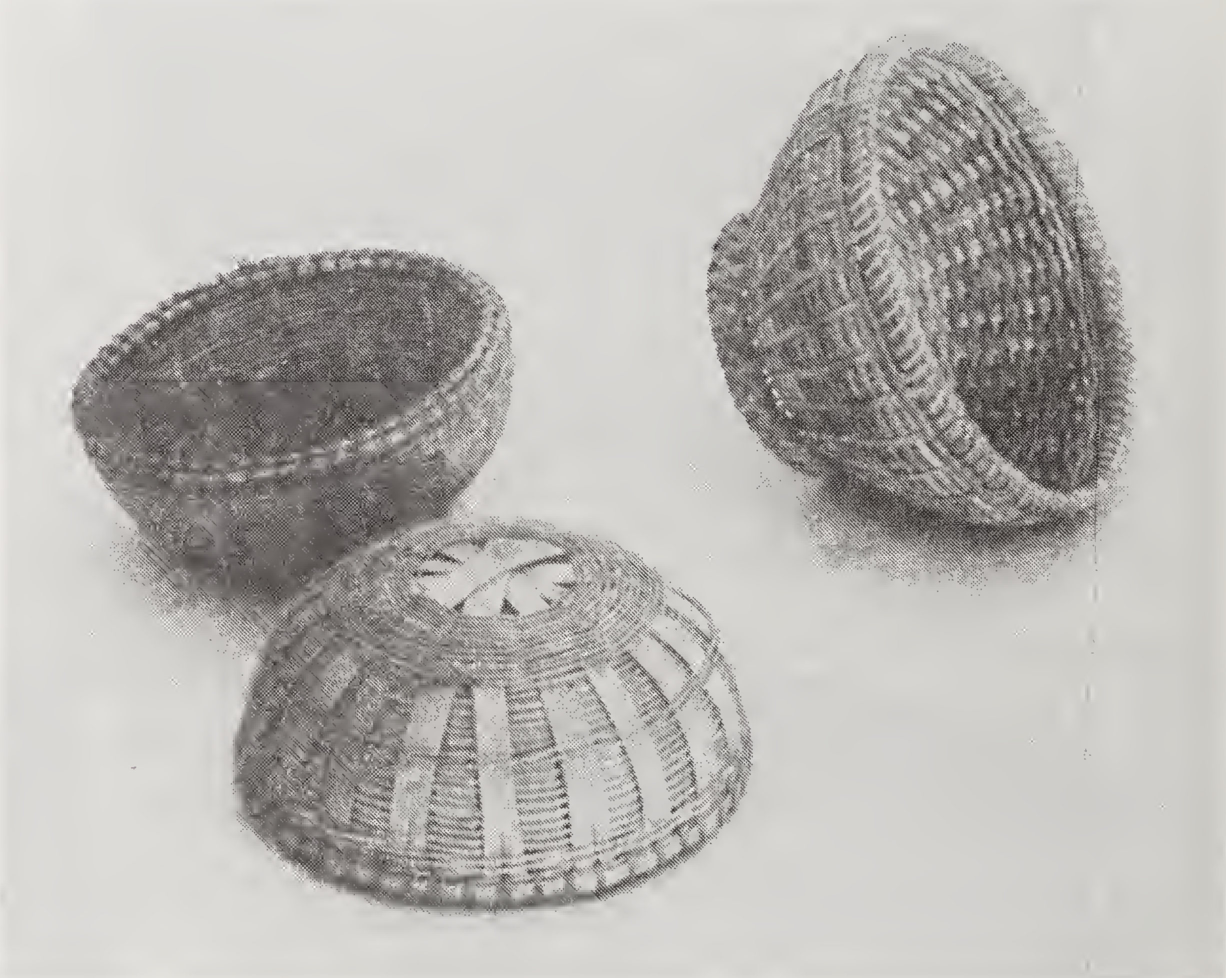
The open-hexagonal structure of the side weave is filled by extra-warp elements which are hooked into the weft element located above the upper row of hexagons. Both ends of this extra-warp element pass along the side, moving downwards to interlace into the existing structure, each end inclined in opposite directions. These pass along the two inclined diagonals of the open hexagons to reduce the open area. These extra-warp elements pass out of the side weave to extend below the base of the basket, all around the perimeter of the base square. At this point, pairs of extra-warp elements are held within two rows of weft elements, formed by twisting split bamboo into ropes, similar in structure to the border used at the top of the basket. Below this, the extra-warp elements form a thick rim by each pair being bent into a self-strengthened rim which is identical in structure to the rim at the mouth of the basket.

The square base is further strengthened by bamboo splits inserted into the weave to form the diagonals of the base square. Two small rings made from twisted bamboo rope are attached to the sides of the basket to receive the braided handle made of cotton or any other available yarn. All bamboo elements are split to utilise the smooth outer layer of the bamboo.



537

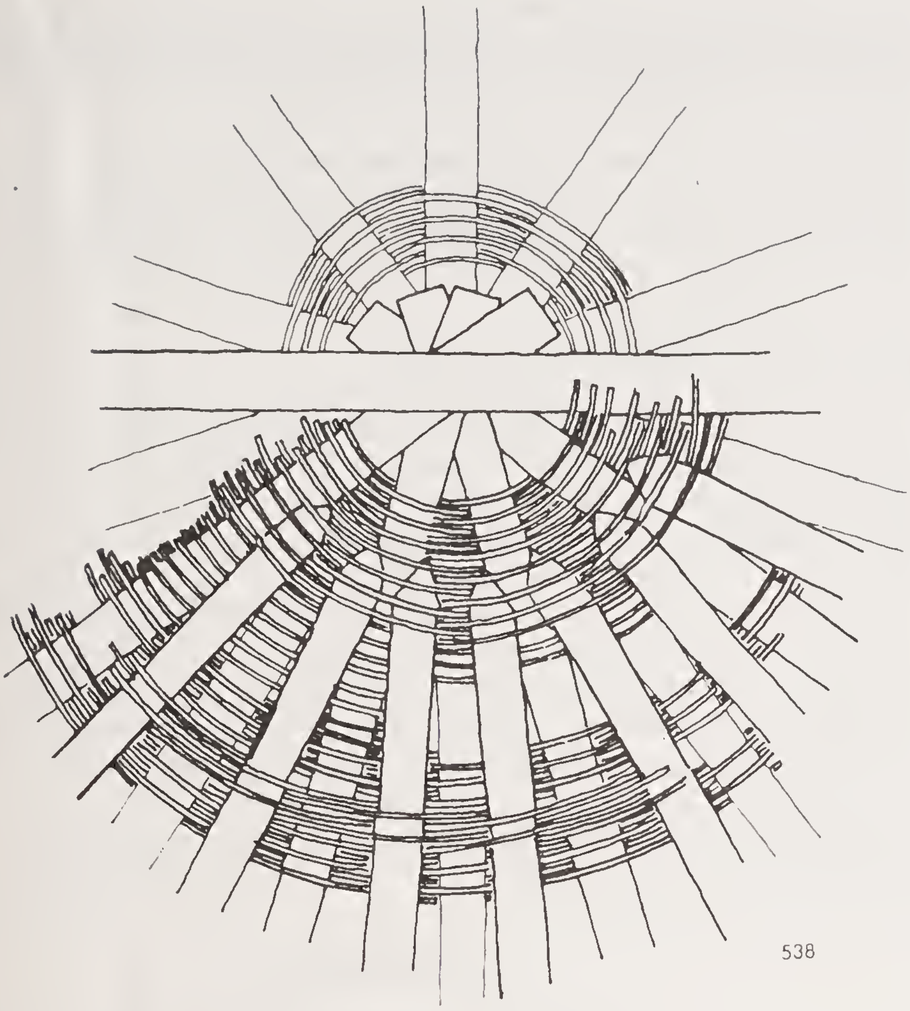
537: The *turi*, the baskets on the left. The basket on the right is a rice measure from Silchar.

Small Baskets for Other Functions

Several types of small baskets are made from bamboo, each intended for a specific function and woven in an appropriate form. Some of these are for containing puffed rice which is eaten directly from the basket, some are measures for rice, while others are to collect and store flowers.

Turi

The *turi* is a small semi-spherical basket made from bamboo and used by the Tripura Bengalis to contain puffed rice (fig. 537). It has a diameter of 170 mm and is 80 mm in height. Wide warp elements overlap radially at the base and these are held between twists of a pair of thin weft elements



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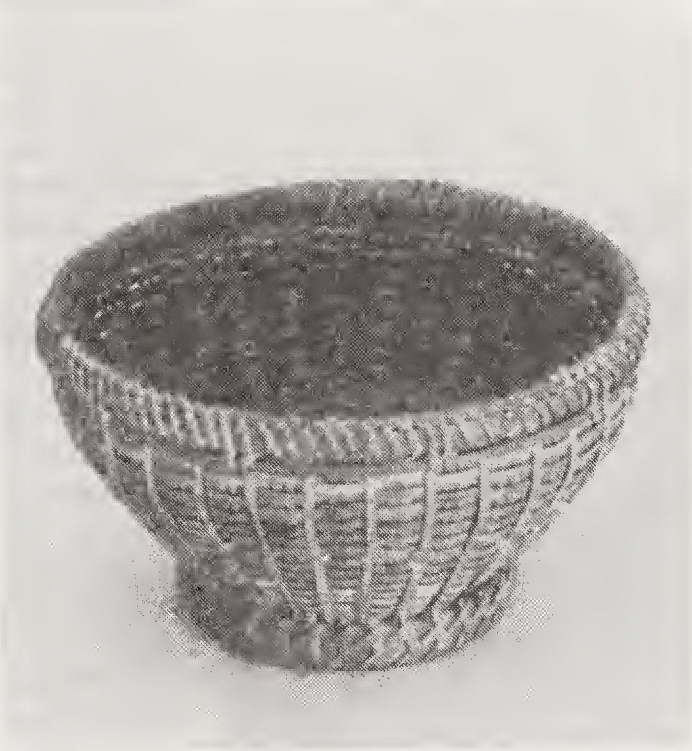

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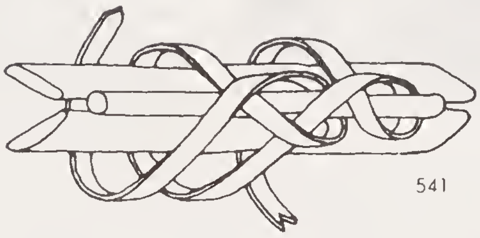

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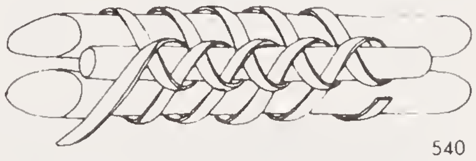
that spiral upwards. This construction is repeated for a few turns of the spiral, after which a tabby structure is formed with a double-start spiral in the weft. Extra-warp elements are added to the outer surface of the basket to cover gaps between the main warp as the diameter of the basket increases (fig. 538). The rim is strengthened by sandwiching between rings made from thick bamboo splits, the woven edge including the extra-warp elements and this rim is bound in a decorative manner using split-cane binding.



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538: A flattened view of the base and side weave of the *turi* showing the additional warp elements introduced as the diameter increases.

539: The rice measure from Silchar.

540: Detail of the rim binding.

541: The movement of the split cane used in the rim binding.

Rice Measure from Silchar

This is a small semi-spherical basket woven form split-cane elements. It is used in Silchar by the Cachar Bengalis as a standard measure for rice. Hence the basket is woven to ensure that the volume is accurately controlled (fig. 539).

Size and Shape

The basket's semi-spherical form rests on a circular band attached to the base. The diameter of the basket is 200 mm and its depth is 100 mm. The ring-like band at the base is 15 mm wide and 110 mm in diameter.

Structure

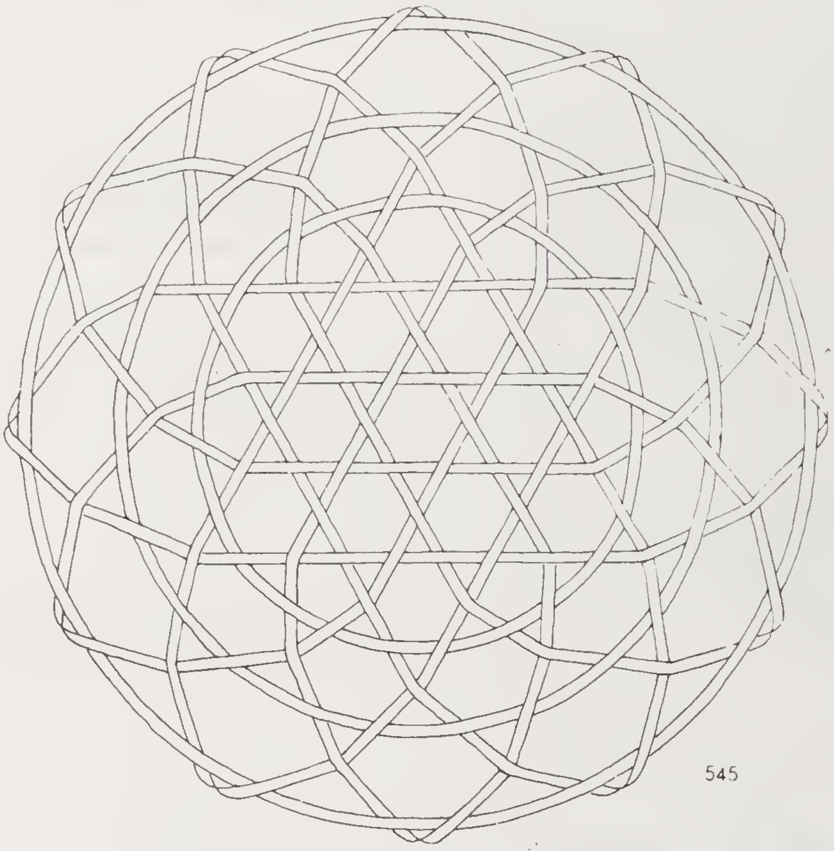
The main warp elements overlap and radiate from the centre of the base, up the sides of the basket. The weft is a single element which is first taken parallel to one of the main warp elements, before being bent sharply to start spiralling around the centre of the base and interlace the warp elements in a tabby structure. This structure is continued for a few turns of the weft spiral, after which an extra-warp element is placed beside each of the main warp elements, to run beside the main warp element up to the rim, as the weft spiral continues. The lower ends of these extra-warp elements are used to bind the ring-like band made from a wide split of cane, using the pulpy core portion of the cane.

A second set of extra-warp elements passes vertically on the outer surface of the basket, lying in the gap between consecutive main warp elements. This second extra-warp is interlaced to the side weave at only two points, one point near the rim and the other halfway down the side of the basket where it passes under the weft. Hence, these extra-warp elements pass over the side as long floats. The lower ends of these extra-warp elements too are used in binding the ring-like band to the base of the basket. The upper rim is strengthened by sandwiching the edge of the side weave between wide splits of cane before being bound together decoratively by split cane (figs. 540, 541).

542

Cattle Muzzles from Tripura, Assam

In the plains of Tripura and Assam, muzzles woven from bamboo are used to restrain cattle from grazing in the rice fields (fig. 542). These are woven like dish-shaped baskets, using a variety of construction methods. The sample acquired from Tripura has wide bamboo splits forming the warp which is arranged to radially overlap at the base (figs. 543, 544). The weft uses three splits of bamboo taken together and twisted so as to hold the warp elements between twists, as it spirals steeply around the side. The rim is self-strengthened as the end of each warp element is reduced to several splits before being bent along the edge to be bound by split-cane binding. The second example acquired was from Nilambazar in Cachar District. This cattle muzzle is woven in the open-hexagonal weave structure in both the base and the sides (fig. 545). Its structure is quite similar to the grass basket which is also from the same area (fig. 334).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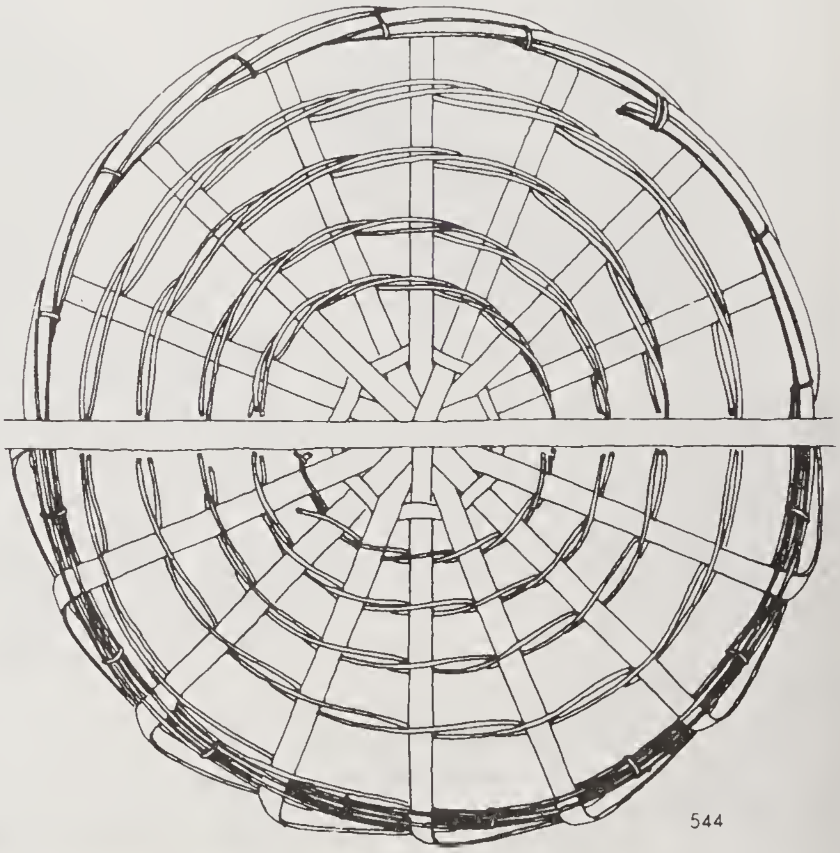
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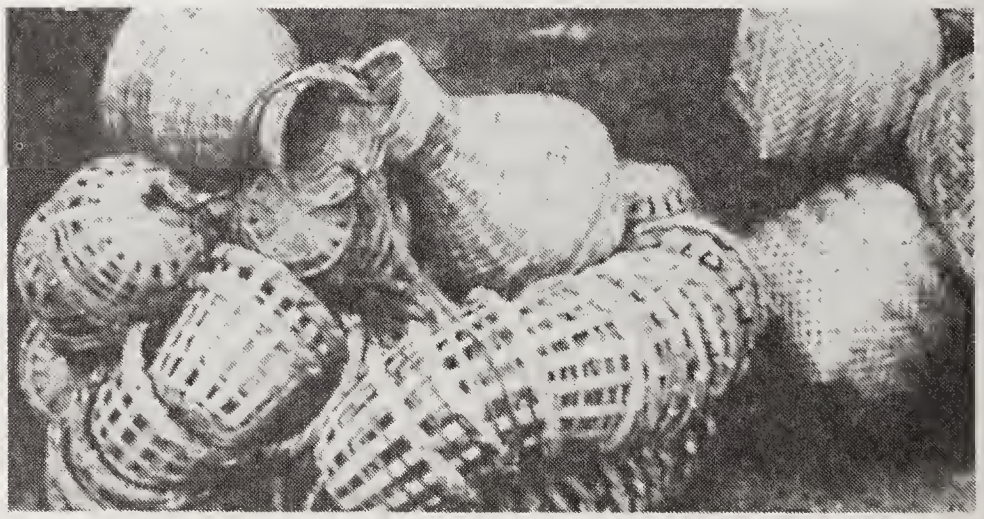
542: A cow with a cattle muzzle.

543: Cattle muzzles and other bamboo products ready for sale.

544: A schematic diagram of the cattle muzzle showing half the view from above and below.

545: A geometric diagram of the cattle muzzle from Assam.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Coiled Cane Containers

A large variety of shapes have been evolved using the coiled cane construction. Coiled cane, as the name suggests, is a process where whole cane lengths are coiled in a tight spiral with each turn growing on the previous ones, just as in coiled pottery. The forms evolved can be either flat or three-dimensional. Normally semi-spherical or cylindrical containers are made using this process. However, more complex shapes can be evolved by varying the growth of the spiral in the horizontal or vertical axis or in both axes simultaneously. These are usually symmetrical along the axis of the cylinder, though totally asymmetrical forms have also been evolved. These coiled cane baskets exploit the flexibility of whole cane elements of a small diameter which can be bent easily without the application of heat.

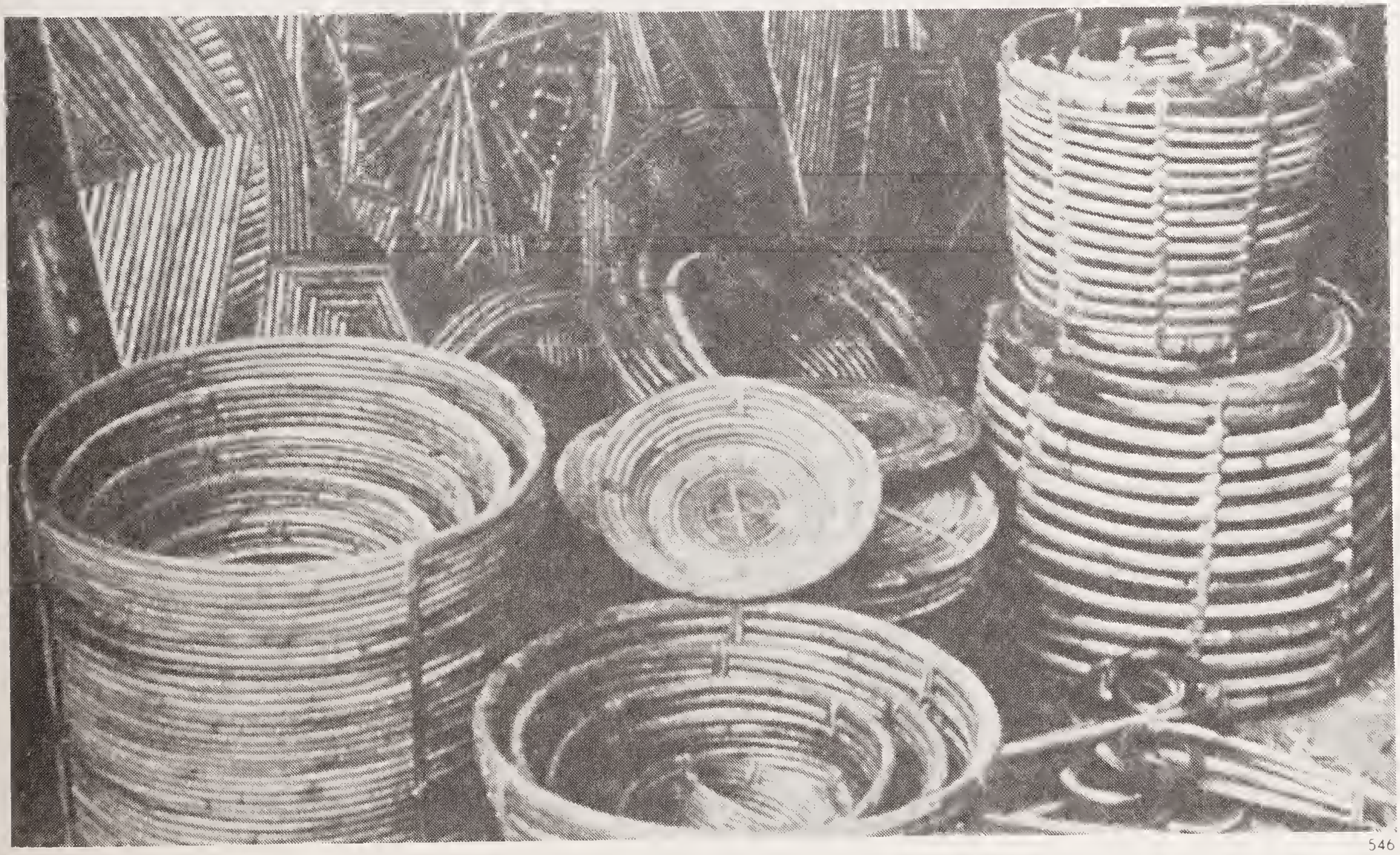
Nailed Coiling

Two basic construction methods are seen in binding consecutive rows of coiled whole-cane elements. The first construction is applied to soft species of cane and is a form of nail-jointed construction. Bamboo nails shaped from a thick split are driven into the whole-cane elements through a hole pierced by a sharp metal pointer. These nails hold consecutive rows of the coiled construction firmly together and the arrangement of these bamboo nails is staggered. The product may be subsequently reinforced by split-cane binding which is kept to a minimum.

Bound Coiling

The second construction uses only split-cane binding to hold consecutive rows of the coiled whole-cane elements. These split-cane elements are wound around a pair of whole-cane elements formed by consecutive turns of the whole-cane spiral and this binding element describes a loose helix moving along with the whole-cane elements. Consecutive pairs of coiling are overlappingly bound by the split-cane binding.

546: An assortment of whole cane products made by a manufacturer at Mangaldoi.



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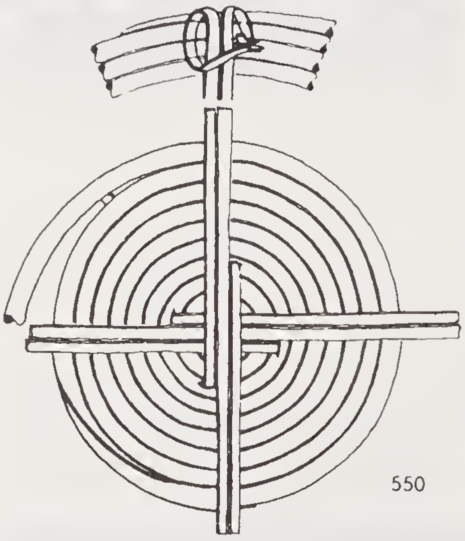
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Coiled Cane Containers from Mangaldoi

A manufacturer of Mangaldoi in Assam produces a range of coiled cane containers, much of which he exports directly. These include a series of semi-spherical containers in varying sizes, a range of cylindrical containers in sets of five or six in sizes suitable for nesting one within the other, and a range of flat circular discs to be used as coasters. Other items made are whole-cane planters, coat hangers and wall and ceiling panelling modules made of plywood, surfaced by whole or split cane elements nailed down in a decorative manner (fig. 546). *Jatti* cane that grows in the plains of Assam is used for all the coiled-cane products. This species of cane is extremely soft and can be bent easily without heat (figs. 547, 548).

Size and Shape

One sample acquired from the manufacturer is a semi-spherical bowl of diameter 240 mm and 100 mm deep (fig. 549). Whole-cane elements of approximately 6 to 8 mm diameter are used. The coiling starts at the centre of the base, at which point the whole-cane element is gradually thinned down to permit bending into the tight spiral that forms the base.

Coiled Construction

As the coiling progresses the element is nailed down to the already coiled structure using bamboo nails. At the point where the nail is required, a hole is made with a sharp metal pointer with a flattened blade, resulting in a slit-like hole. Previously-prepared bamboo nails are hammered into this slot using the flat surface of a *dao*.

After a sufficiently large circle has been formed at the base, a second whole-cane element with its end appropriately thinned is held within turns of the first element before both elements continue to spiral as a two-start spiral. At the rim, the end of the spiralling element is thinned down in order to achieve a rim that finishes at one horizontal level. The tip of the spiralling element at the rim is inserted into a slot in the element below and wedged tight.

Protective Binding

Two sets of split-cane binding elements pass along the outer surface of the coiled container to cross at the base at right angles. Each set is locked into the base by passing onto the inner surface through slots in the coiled

547: A craftsman scraping off the dark outer skin of the cane before it is used.

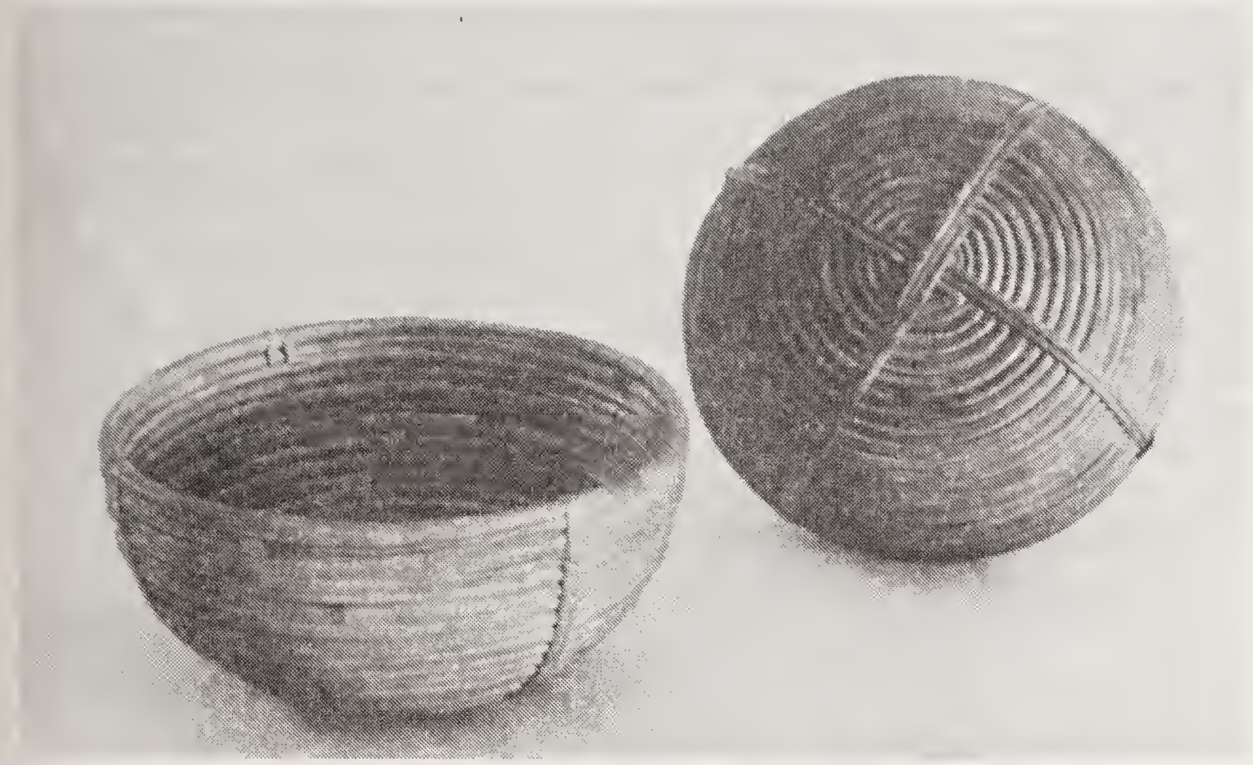
548: A craftsman making a cylindrical coiled cane container. The flat surface of the *dao* is used to drive in the bamboo nail.

549: Coiled cane bowls from Mangaldoi.

550: A schematic diagram showing the construction of the base and the end of the coil at the rim.

551: The container is held over the smoke of dry banana leaves to give it a rich red-brown colour.

552: A diagram of the indigenous device used for the smoke treatment.



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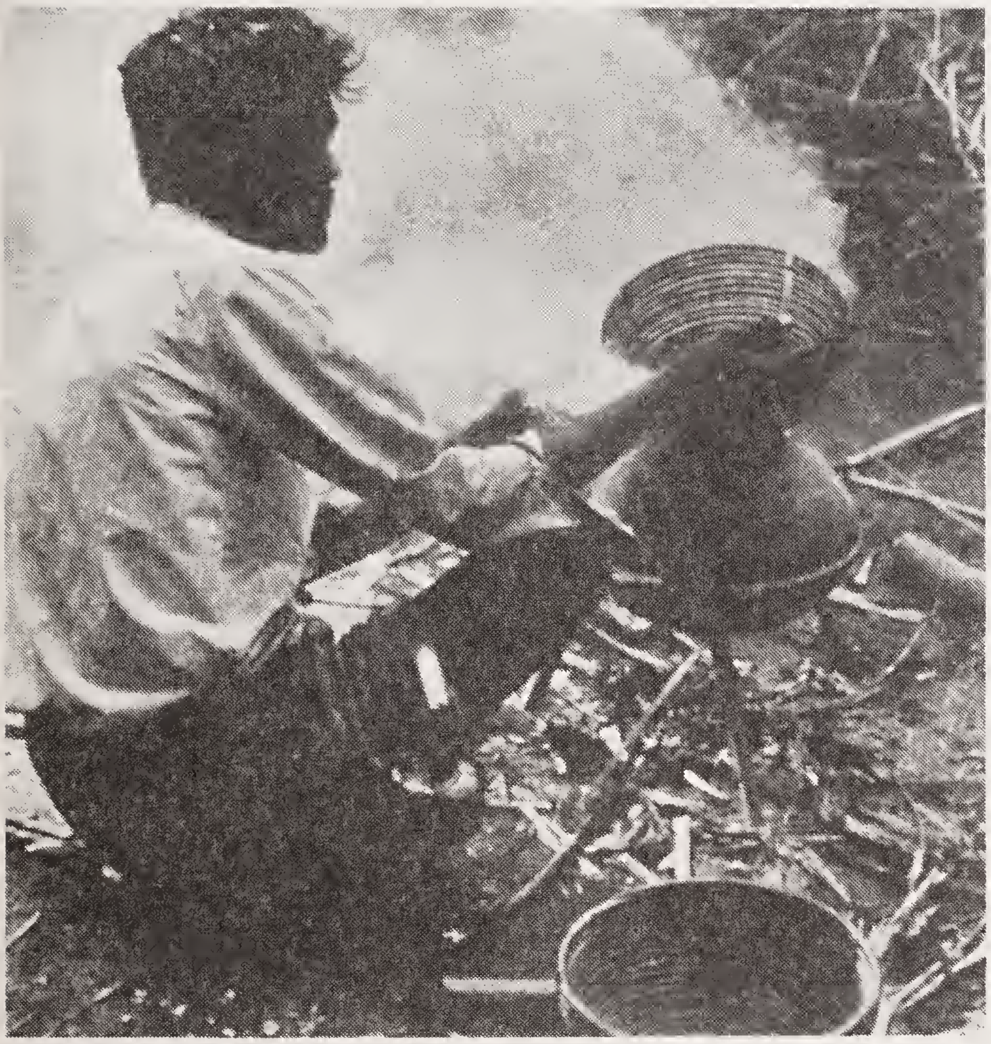

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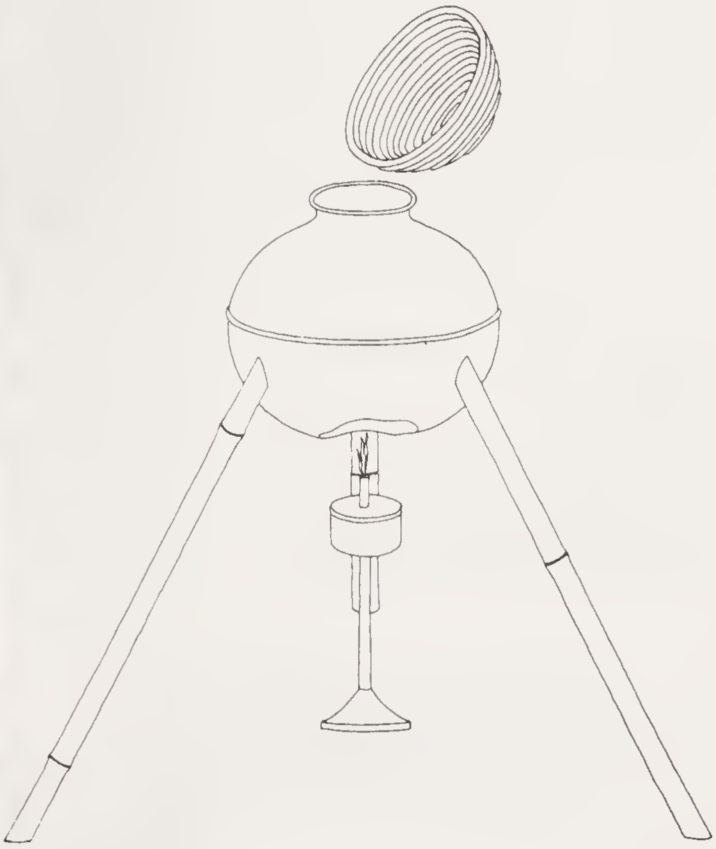

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elements near the centre of the base. These elements are locked in a similar way at the rim and they prevent the coils from coming apart or being loosened at the nailed joints (fig. 550).

Smoke Treatment

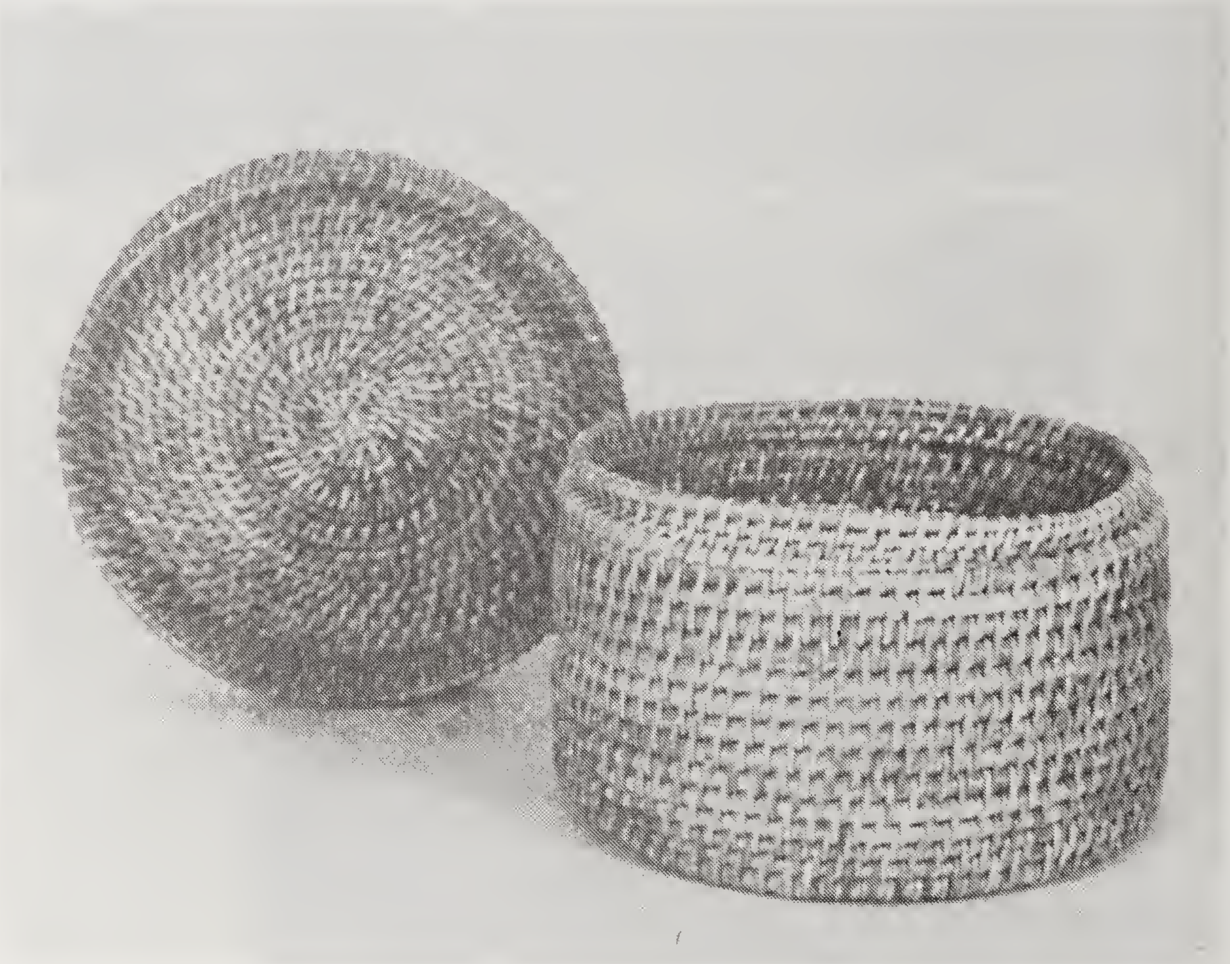
The craftsmen at the Mangaldoi workshop demonstrated a novel method for smoke-treating these cane products (fig. 551). The products that are white or off-white in colour before treatment turn a deep red-brown colour after only a few minutes of this treatment. The equipment used is a simple indigenous device that can be made easily from locally available materials (fig. 552). A medium-sized terracotta pot is taken and a part of its bottom is knocked out. The pot is filled with dried banana leaves and propped up on a bamboo tripod before the leaves inside the pot are lit with an oil lamp. As the leaves begin to burn a large quantity of dense white smoke billows out of the mouth. The leaves are not allowed to burn with a large flame and more leaves are stuffed into the pot as required. The coiled cane container is held over the mouth of the pot and rotated so that all sides are smoked evenly.

As the coiled-cane container warms up, an oil-like substance is deposited on the surface of the cane and the colour of the product changes dramatically. The sticky oil on the surface is allowed to dry in the shade and the product at this stage must be protected from dust which can easily adhere to the surface. The change in colour is a permanent one. This process is used selectively and not all products are smoked as the manufacturer does not find it economical for large volumes of production. However, the possibility of commercially exploiting this process is clearly visible.

553: A coiled cane container from Shillong.

554: The coiled cane container with its lid open.

555: A schematic diagram of the base and side showing how the split cane strip holds the coils together.



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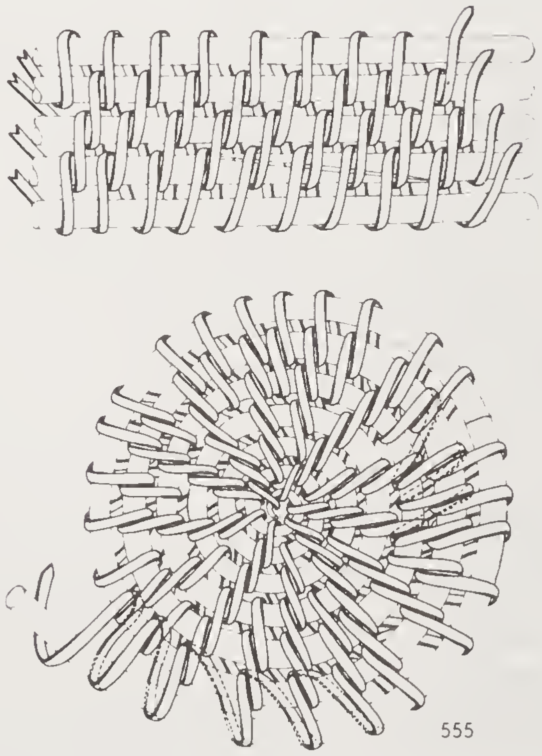

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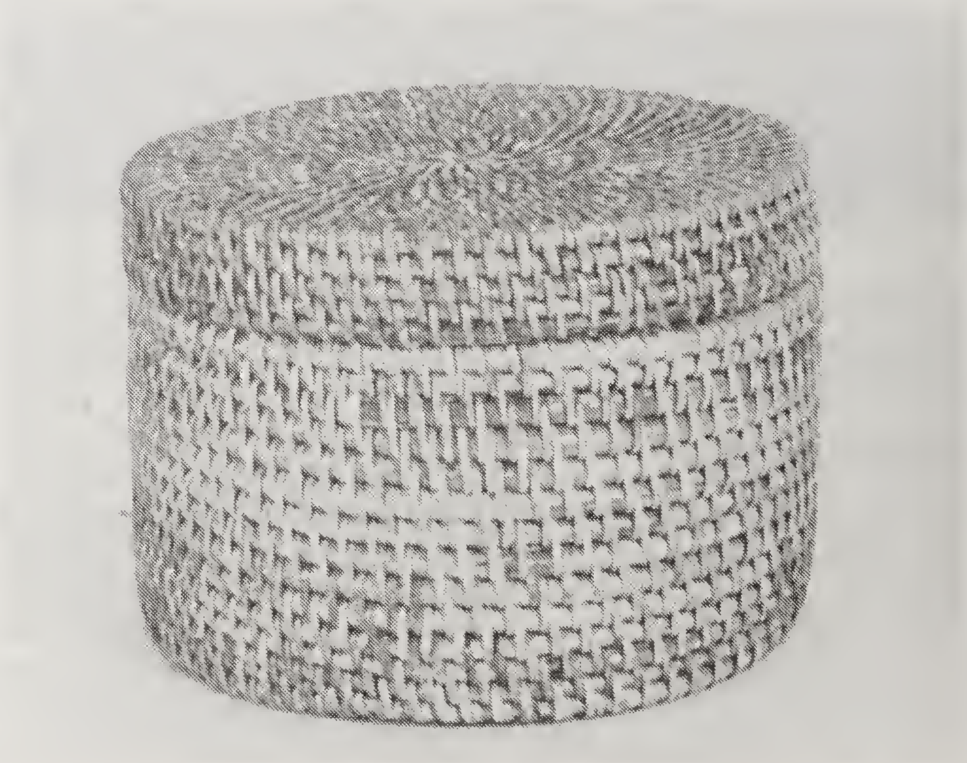

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Coiled Cane Containers from Shillong

This coiled-cane container was acquired from the NEHHDC Emporium at Shillong.

Shape and Size

The container is in the form of a cylinder of diameter 205 mm and height 145 mm (fig. 553). It has a lid of the same diameter which has a rim that overlaps part of the container side at the top. At this part the coiled rim of the container has a smaller diameter than the sides, with a band being slightly recessed. This part receives the rim of the lid.

Coiled Construction

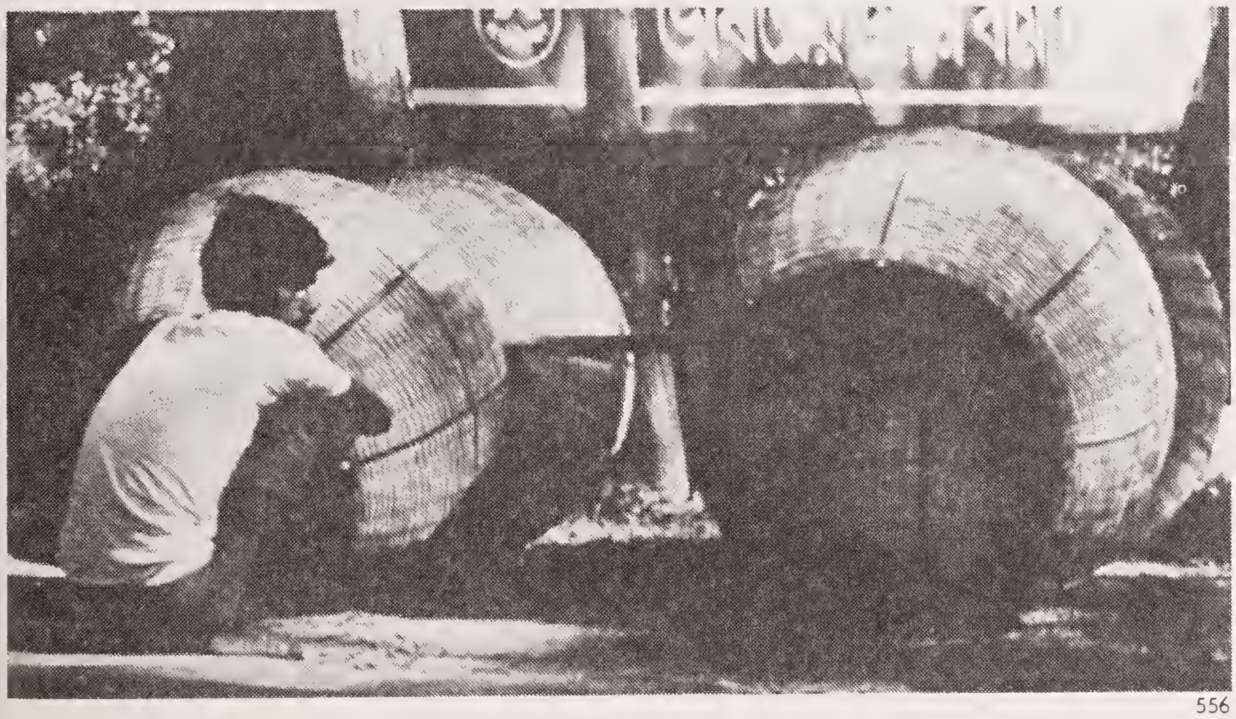
Both container and lid are made by coiled whole-cane elements (fig. 554). A flat circular base is first formed by a single whole-cane element coiled as a tight spiral. At the centre of the base this element is thinned down so that it can be bent easily into the small spiral. Split-cane binding holds consecutive turns of the spiralling whole-cane element, being wrapped around the pair as they move around the container (fig. 555). This construction results in a very rigid container and the texture created on the surface by the binding tends to form a pattern of inclined lines. These containers are sold in sets of three or four nesting one inside the other.

Large Storage Baskets

Large storage baskets woven from bamboo splits are used all over the northeastern region. The forms of these baskets and the method of construction varies from place to place. These baskets can be classified into two main categories, namely, "grain storage baskets or bins" and "storage baskets for clothes and valuables".

Grain Storage Baskets

The grain storage baskets are normally very large structures woven from bamboo splits and the construction methods and weave structures correspond to those used in the large closed-weave carrying baskets of the same tribe or area (figs. 556-559). Several types of grain storage baskets were seen in Tripura, Assam, Nagaland, Manipur and Mizoram. Some of the hill tribes build granaries which are constructed like their houses, standing on stilts (see also Adi Gallong house).



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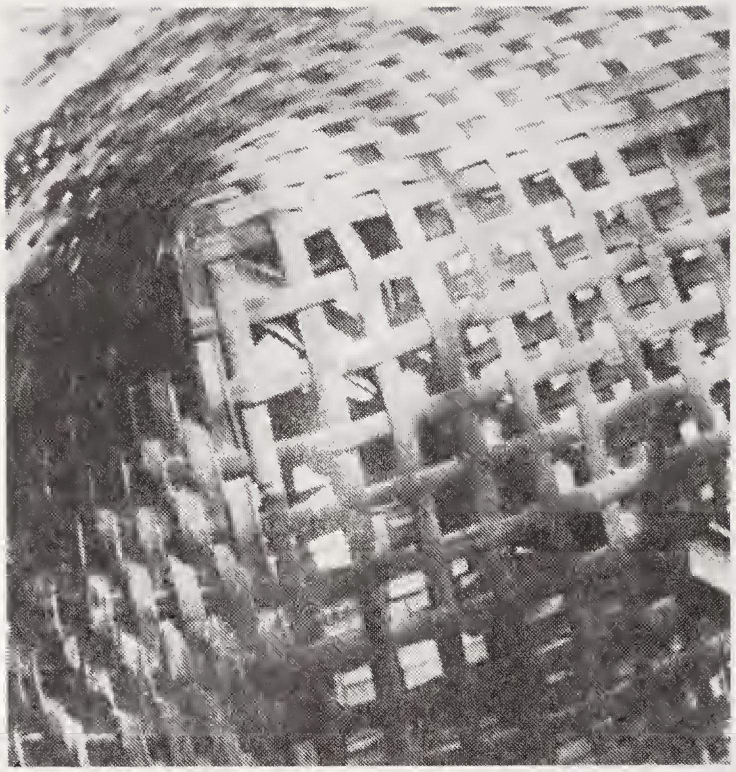
556: Large grain storage baskets being taken to a bazaar in Nalbari.



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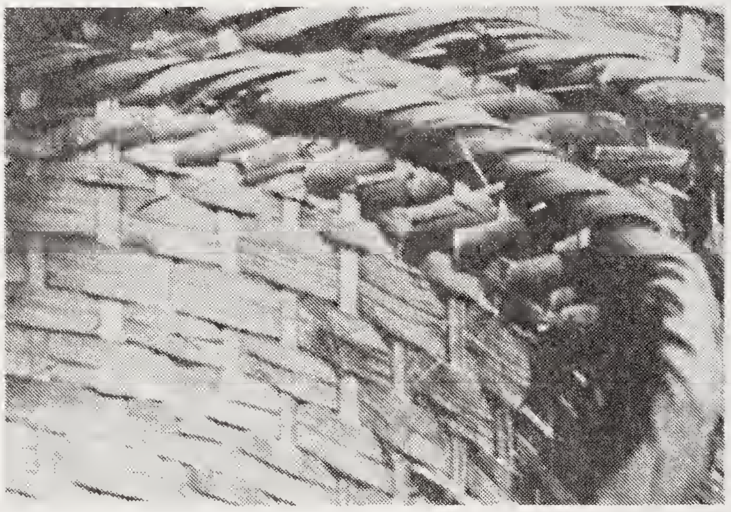

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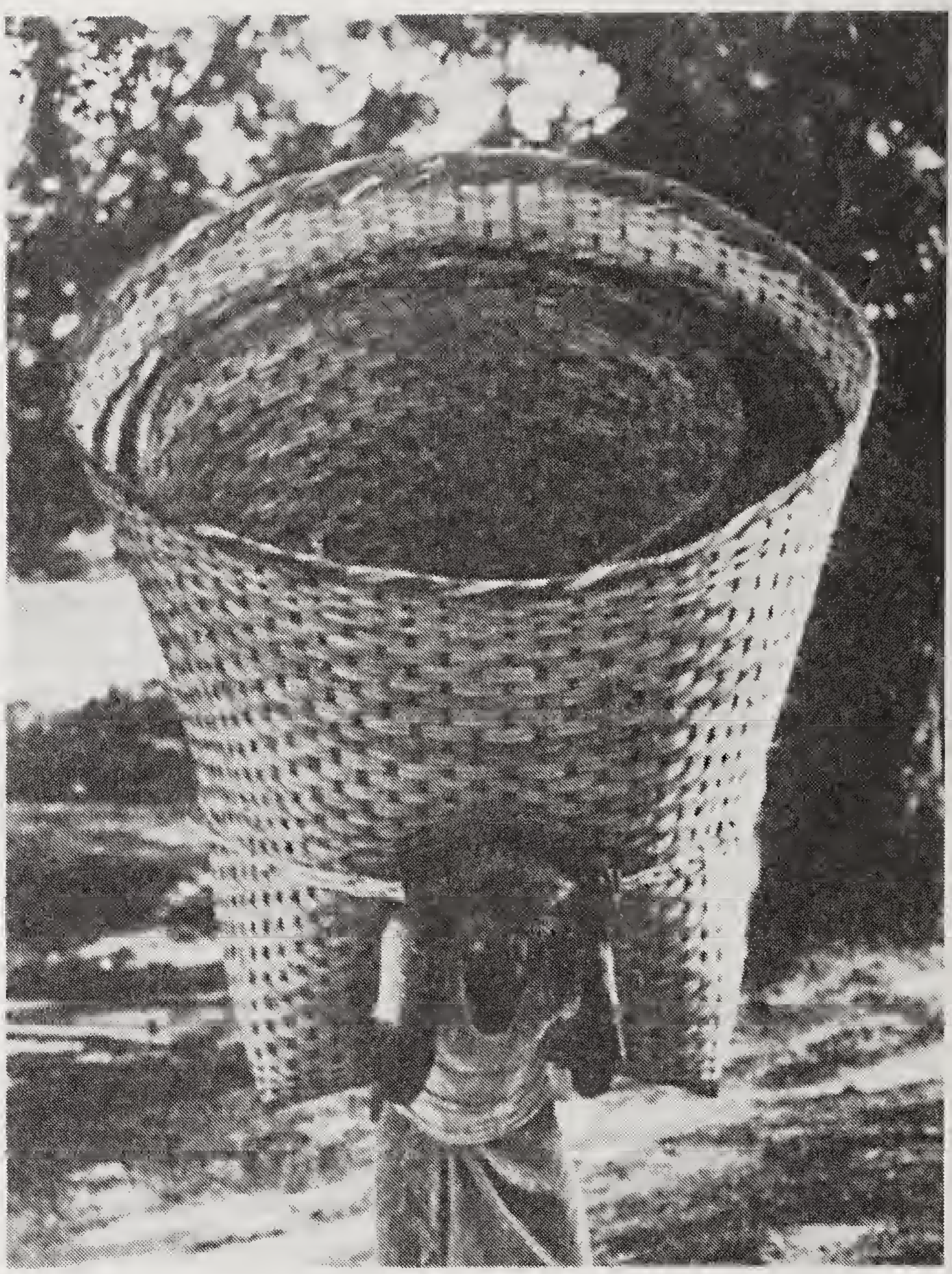

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557: Large bamboo grain storage baskets being carried to the bazaar for sale.

558: The double-walled structure of the base of the grain basket.

559: The rims of nesting grain baskets.

Grain Storage Baskets from Tripura, Assam

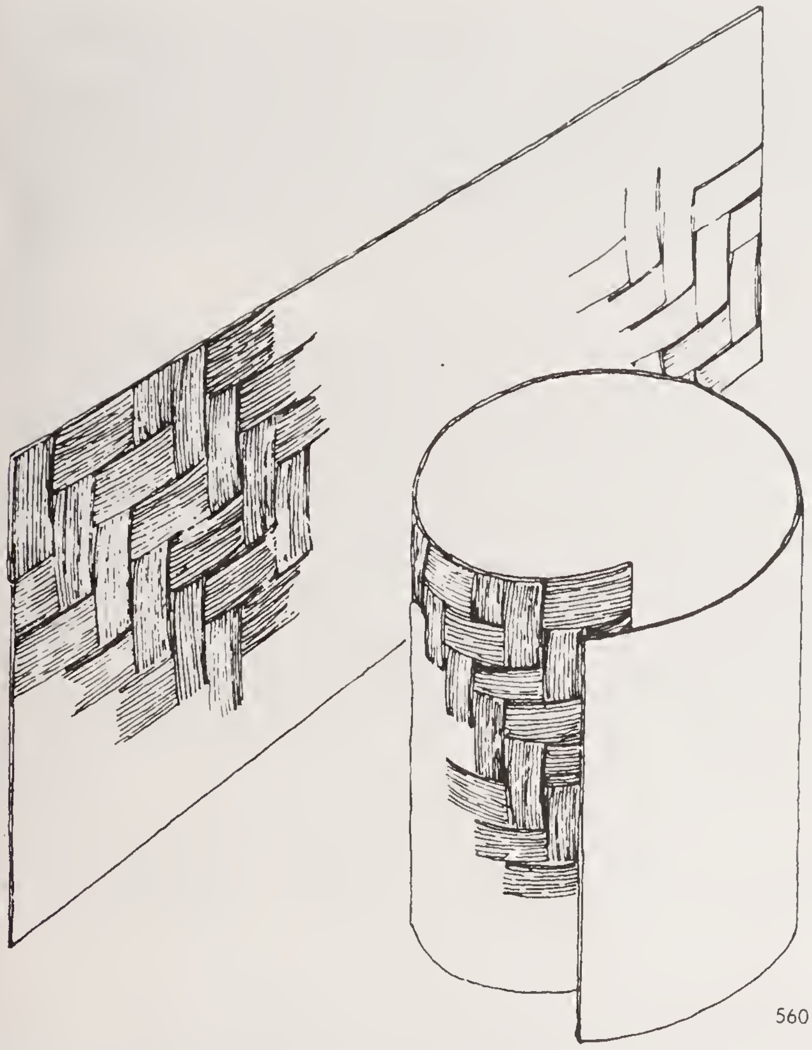
The grain storage basket seen in Tripura had a large square base with the sides tapering out to a large circular rim. These baskets are made by professional craftsmen and sold at weekly bazaars. They are plastered with a mixture of cowdung, clay and rice husk before being used to store grain. Similar grain storage baskets were seen in Bangla Bazaar in Kamrup District of Assam and at bazaars in Cachar District.

Grain Storage Basket from Nagaland

Grain storage baskets were seen in several villages in Nagaland. These baskets too have a square base with the sides rising to form a circular rim. The opening at the top is covered by a conical lid also woven from split bamboo. At Dimapur in Nagaland unusual grain storage bins are fabricated from large bamboo matting woven from flattened bamboo boards (figs. 560, 561). The mat is curved to form a large cylindrical tube by overlapping the vertical edges of the mat. The joint between the overlapping ends and the open circular edges are strengthened by rings made from thick splits of bamboo bound to the surface of the mat. These tubes are placed on top of a surface of bamboo matting which is raised above the floor and grain can be poured in through the opening at the top.

Duli

The *duli* is a medium-sized storage basket used by the Assamese to store grain. It is a cylindrical shaped basket woven from bamboo splits. The weave



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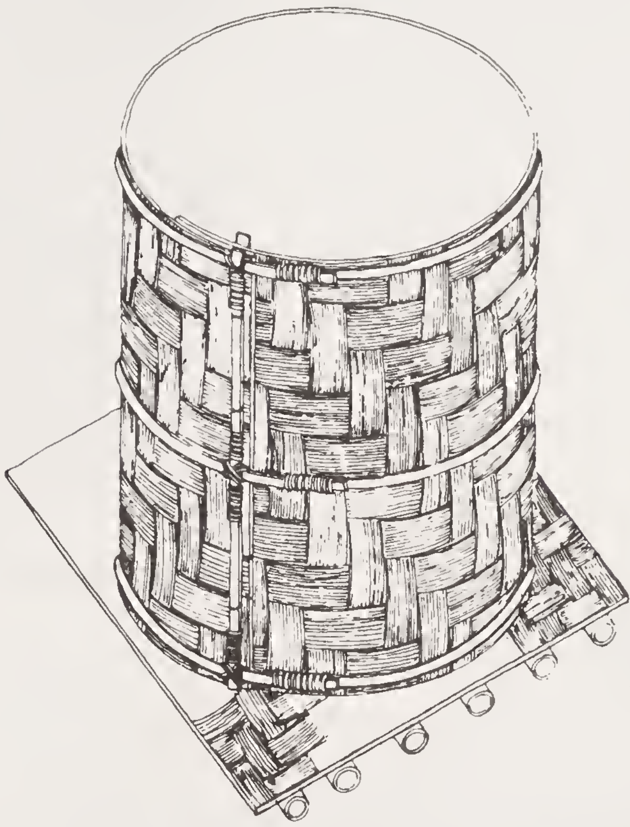

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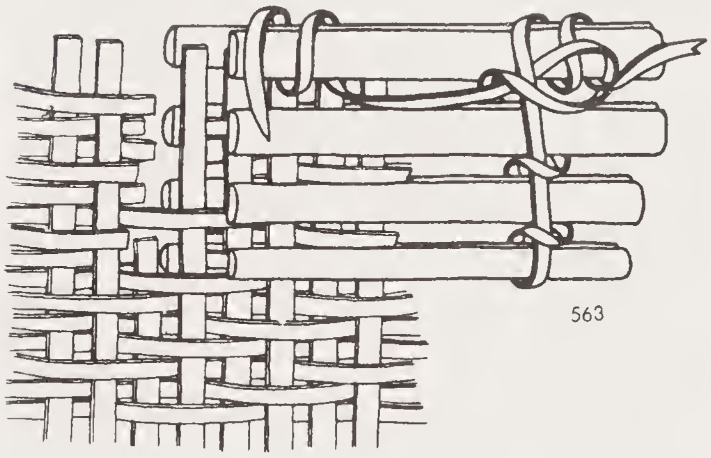

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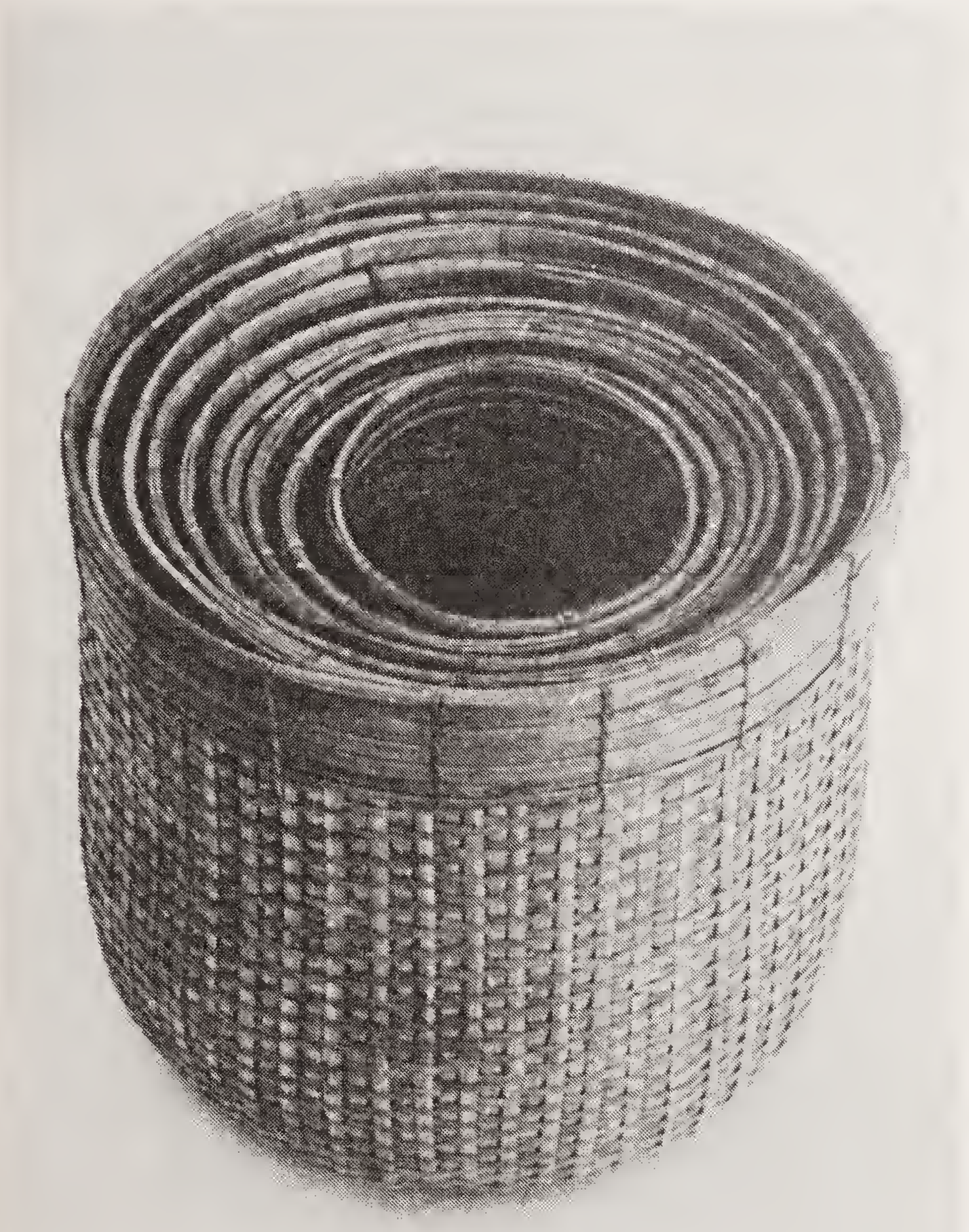

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560: The method of construction of large grain storage baskets seen in Dimapur.

561: The completed cylinder on a mat base.

562: A set of ten nesting *dulis*.

563: Detail of the construction of the rim of the *duli*. Several pairs of thick bamboo splints sandwich the upper edge of the basket.

structure is similar to the *pasi*, a shallow carrying basket used in the same area. These baskets are made at Nalbari in Kamrup District of Assam. Nalbari and several villages surrounding the town have a large concentration of professional craftsmen producing bamboo baskets which are sold at bazaars in the surrounding villages; some transport their baskets to Gauhati.

Nesting Baskets

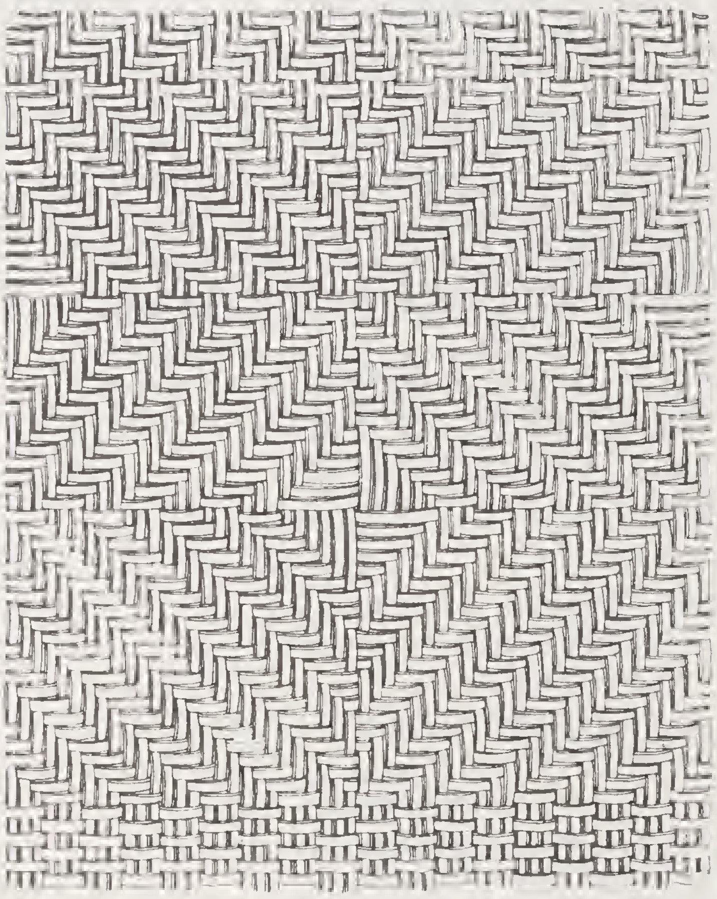
The *duli* has been made in the form of a nesting set containing as many as ten baskets, each smaller than the other (figs. 562, 563). The largest basket has a diameter of 400 mm and is 400 mm in height. The smallest is 180 mm in diameter and 220 mm in height. The others are graded in suitable intermediate sizes. The adaptation of the principle of nesting these baskets has enabled local craftsmen to market their product through various government marketing channels such as handicraft emporia and the saving in volume has made these products cost-effective for transportation to uncountry and export markets. This is a good example where a native product has been appropriately modified to solve marketing problems, without losing the strengths inherent in the product.

Phingaruk

The *phingaruk* is used by the Manipuri tribe for storing clothes and valuables (fig. 564). This basket is made from split bamboo woven to form a container and a lid.

564: The *phingaruk*, a Manipuri basket used to store clothes.

565: The decorative side weave.



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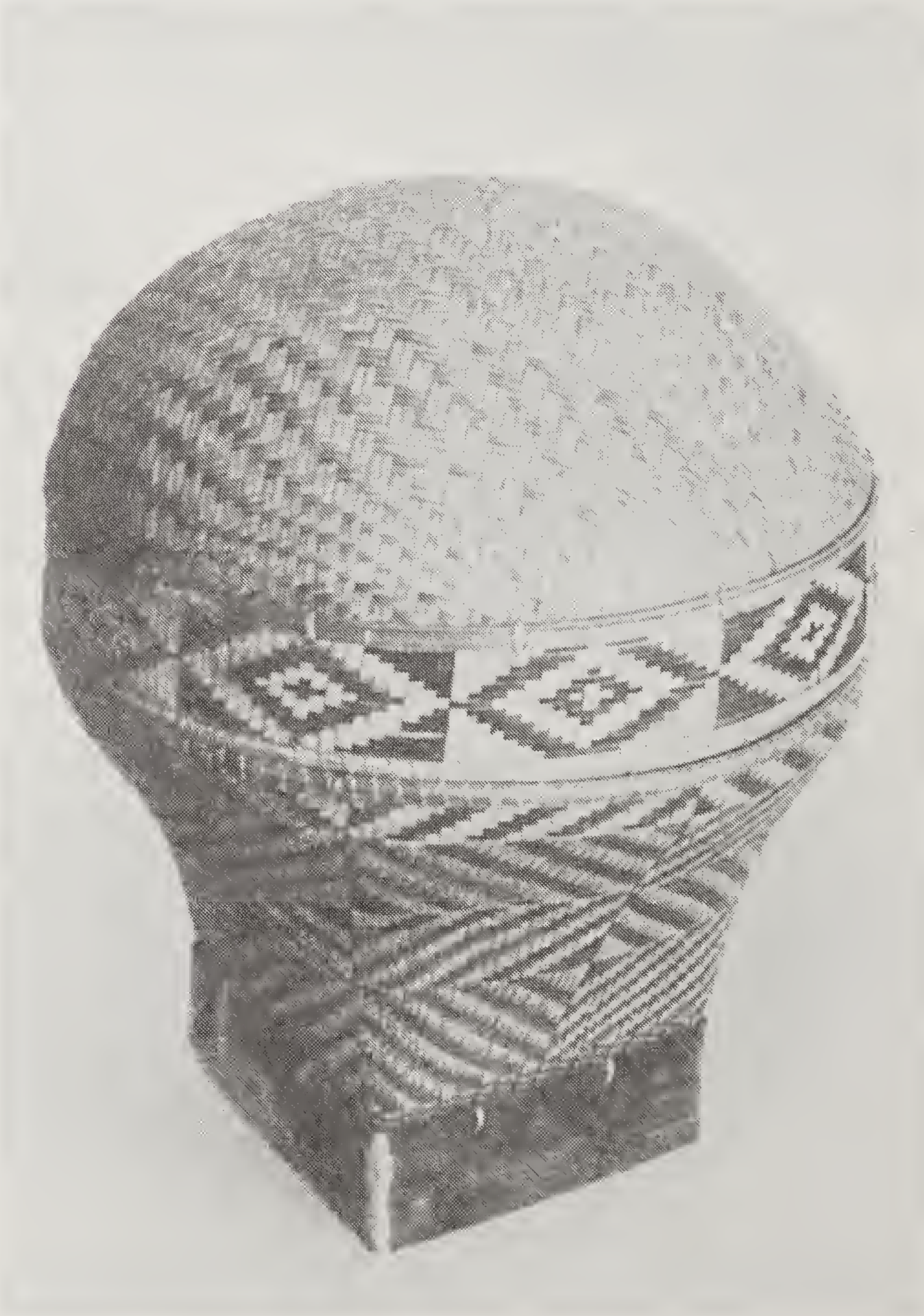

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Size and Shape

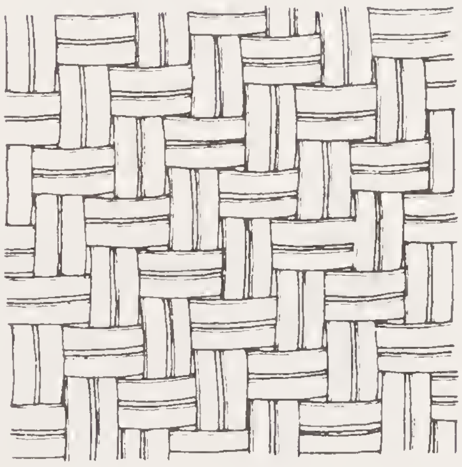
The container part is a double-walled structure. The inner layer is woven with a square base and the sides flare out to a circular rim. The diagonal of the base square measures 260 mm, the diameter at the rim is 375 mm and the height of the container part is 290 mm including the 65 mm wide split-bamboo pedestal. The semi-spherical lid has a diameter of 375 mm and is 190 mm deep.

Structure and Construction

Wide splits of bamboo are used in both warp and weft of the inner layer. Warp elements interlace in a twill structure to form the base, while in the sides a spiralling weft interlaces the warp in a one-up-three-down weave structure. The outer layer is woven to fit snugly over the sides of the inner layer like a sleeve open at both ends not covering the base. At the rim, both layers are sandwiched between rings of strong bamboo splits and bound by split-bamboo binding. Another ring made of a wide split of bamboo is attached to the rim in order to receive the lid. The base is strengthened by thick bamboo splits inserted into the weave to form the diagonals of the base square. A wide split of bamboo is attached to the perimeter of the base to form the pedestal on which the basket stands and the woven base is held away from the ground.

Vegetable Dye

The weft elements of the outer layer are dyed to a deep brown-black colour using an indigenous vegetable dyeing process. The bark of a locally available tree called *shai-kui* is pounded and boiled in water. The bamboo splits to be dyed are put in the boiling mixture for a short while before being taken out to be dried and smoked over the fireplace. The weave structure used in the outer layer is a twill which results in a diamond pattern repeated around the surface (fig. 565).



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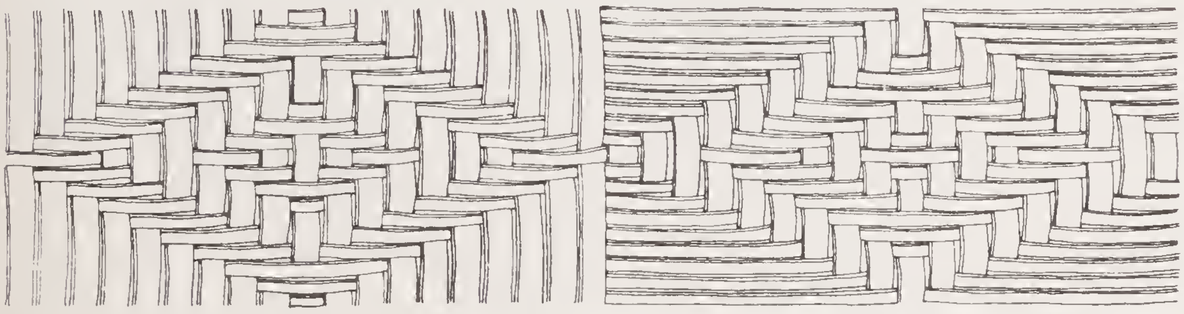

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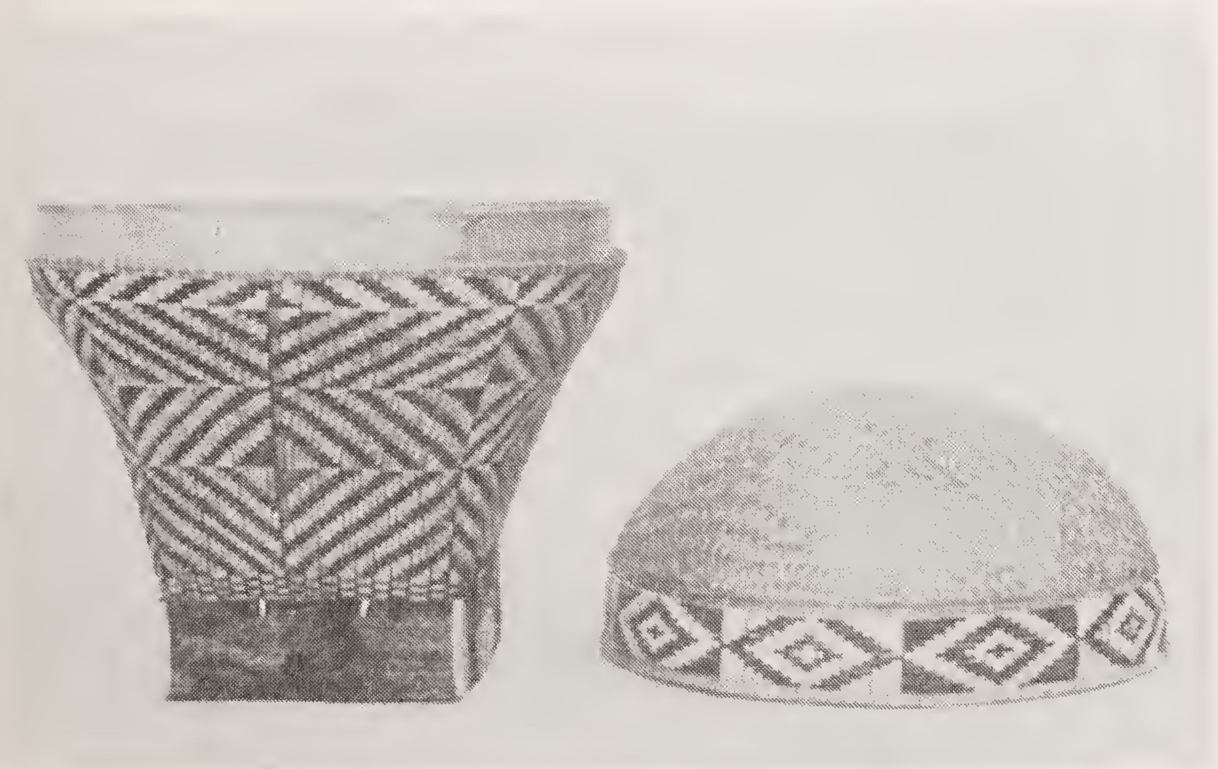

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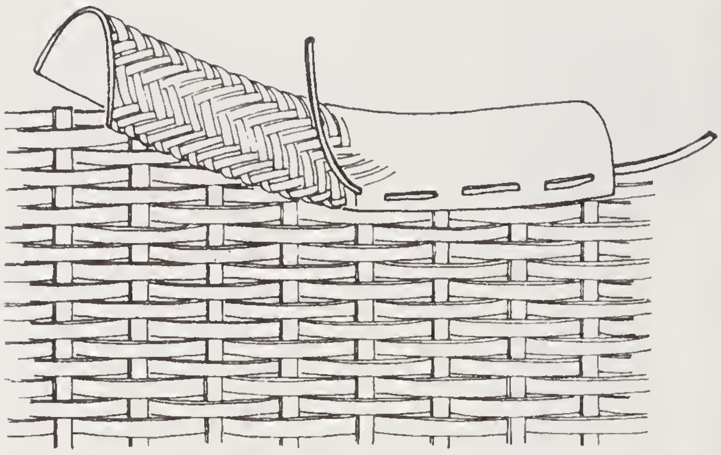
566: The *phingaruk* with its lid by its side.

567: The weave structure of the lid.

568: The weave on the band around the lid.



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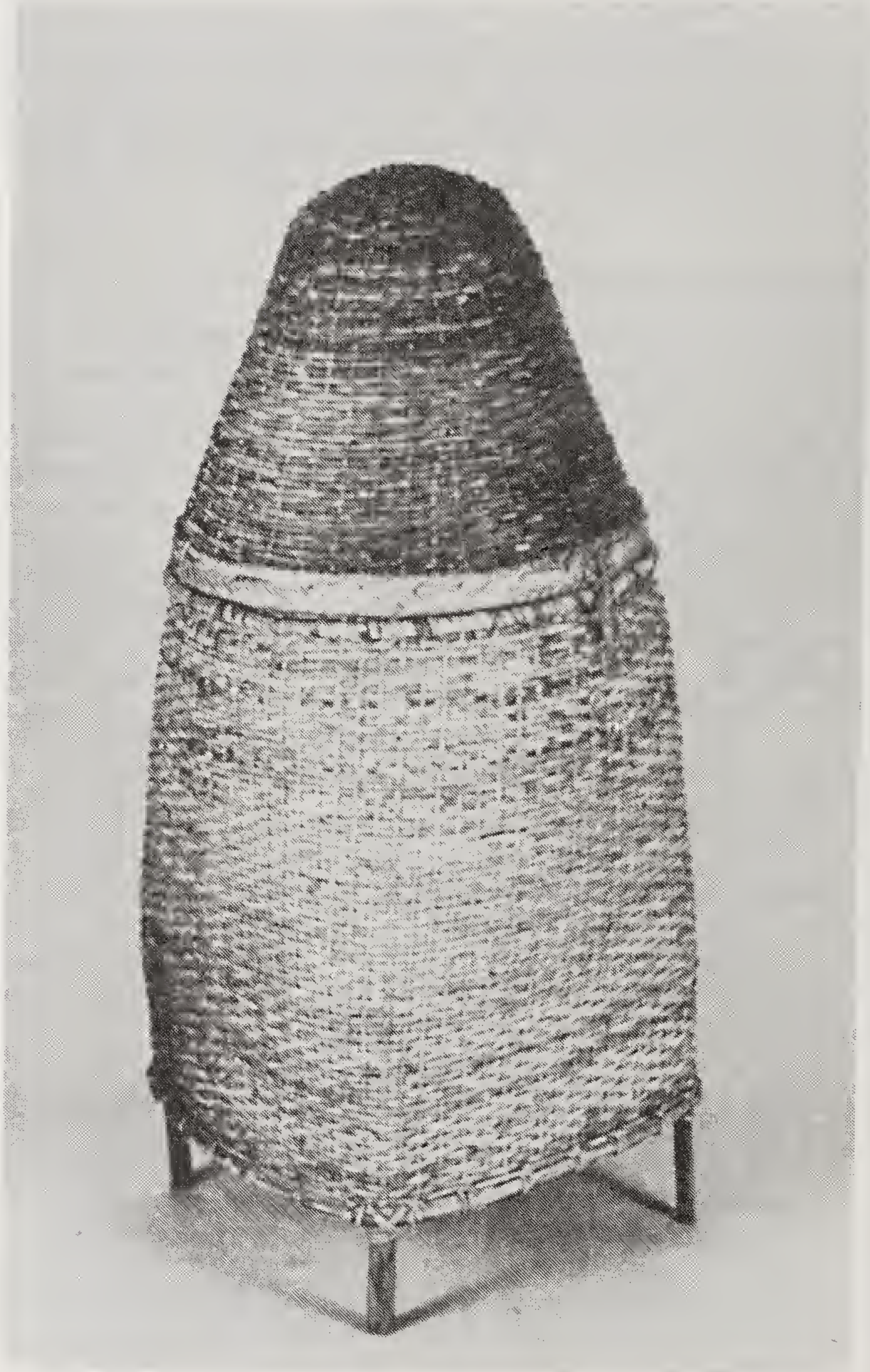

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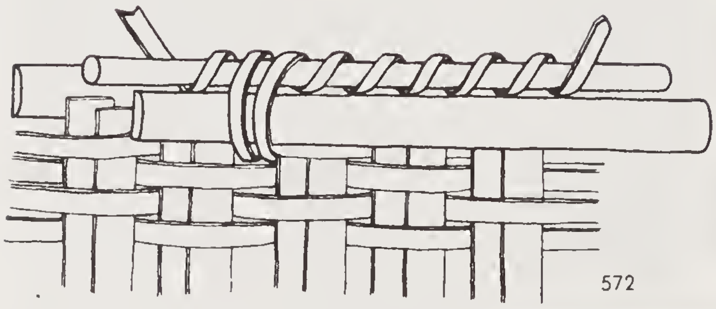

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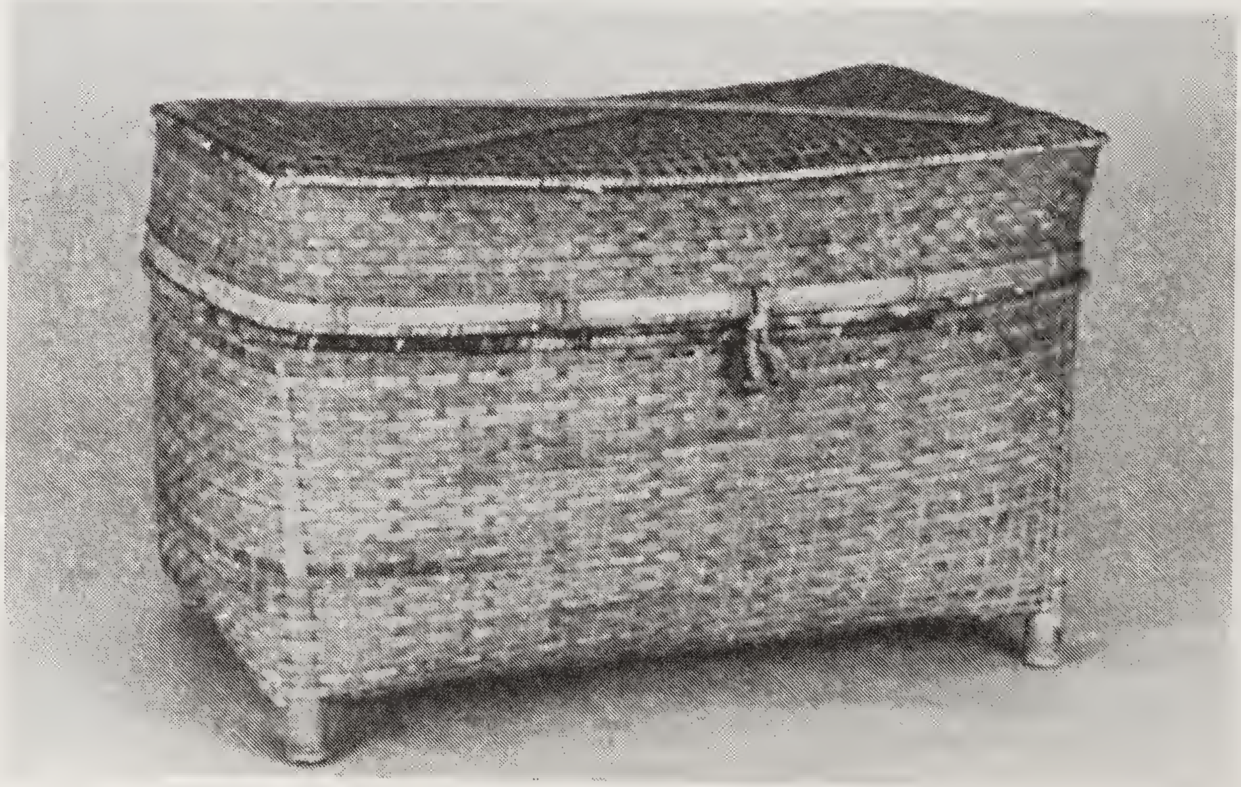
569: The *khen*, a Nocte basket used to store clothes.

570: The method of finishing the rim of the body and the lid of the *khen*.

571: The Khasi storage basket.

572: Detail of the rim binding.



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Lid

The lid is made by the process of mat moulding. A mat woven in a twill structure is moulded into a semi-spherical dome (figs. 566, 567). The circular rim of this dome is strengthened by sandwiching between two rings of thick bamboo splits. The warp ends extending above these strengthening rings are interlaced by wide weft elements to form a wide band. This band has a second layer overlapping its outer surface and this layer uses vegetable-dyed weft elements interlacing the natural coloured warp element to form a decorative band around the rim of the lid (fig. 568). Both layers are sandwiched between rings of split bamboo bound by decorative binding using thin bamboo splits.

Khen

The *khen* is a storage basket used by the Nocte tribe to store clothes and valuables (fig. 569). A similar basket is used by their neighbours the Wanchos and is called the *sawk*.

Shape and Size

The basket is woven in a combination of bamboo and cane splits. It is shaped like a tall square-based prism which narrows down near the top to a small circular mouth. This is covered by a conical lid hinged to the container. The container stands on four legs of stout bamboo splits which extend up to strengthen its sides. The diagonal of the base square measures 380 mm and the diameter of the circular rim is 240 mm. The height of the container excluding the lid is 580 mm. The diameter of the lid is 320 mm and is 260 mm deep.

Container Structure

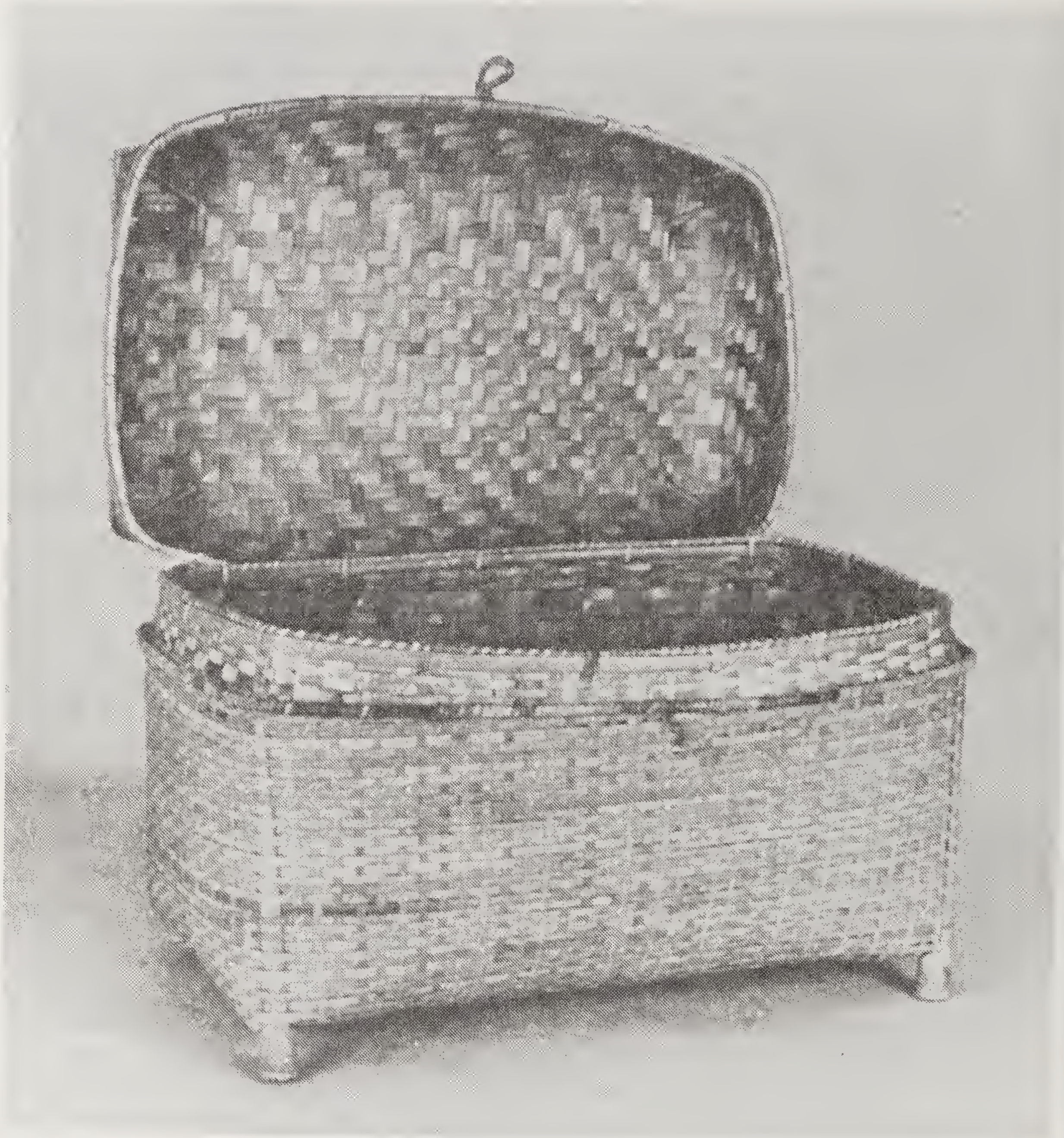
Both container and lid have a double-walled structure. The inner layer of the container is woven from wide splits of bamboo to form a square base before a spiralling weft element forms the side walls by interlacing the warp elements in a tabby structure. The bamboo splints forming the legs are attached to this layer before the outer layer is woven using split-cane elements. This layer is like an open tube which fits snugly around the inner layer. The space below the base is filled in by a third part, woven like a shallow, inverted, square-based tray. The rim of this tray and the lower edge of the outer layer are sandwiched between rings of half cane splits and bound by split-cane binding. The upper edge of both the inner and outer layers are held between a cane braided belt which is folded widthwise to pass along the circumference of the rim before being stitched together by a length of split cane (fig. 570).

Lid Structure

The conical lid has its outer layer woven with split cane. Warp elements overlap radially at the top, before radiating down the sides, to be interlaced by a spiralling weft of split cane, interlacing the warp in a tabby structure. The inner layer is woven in an open-hexagonal weave using split-bamboo elements and this layer follows the contour of the outer layer. Palm leaves are placed overlappingly between the two layers to make the lid water-proof before both layers are held together at the rim by a braided cane belt folded and stitched as at the rim of the container. The lid overlaps the mouth of the container, to rest on a whole cane strengthening ring, bound to the side by split-cane binding. The hinge is a ring of split cane that passes through two loops, one attached to the container and the other to the lid.

Khasi Storage Basket

The Khasi storage basket acquired from Shillong's Bara Bazaar is a rectangular box with a lid and is woven from split bamboo (fig. 571). It is



573: The container and lid have a double-wall structure.

573

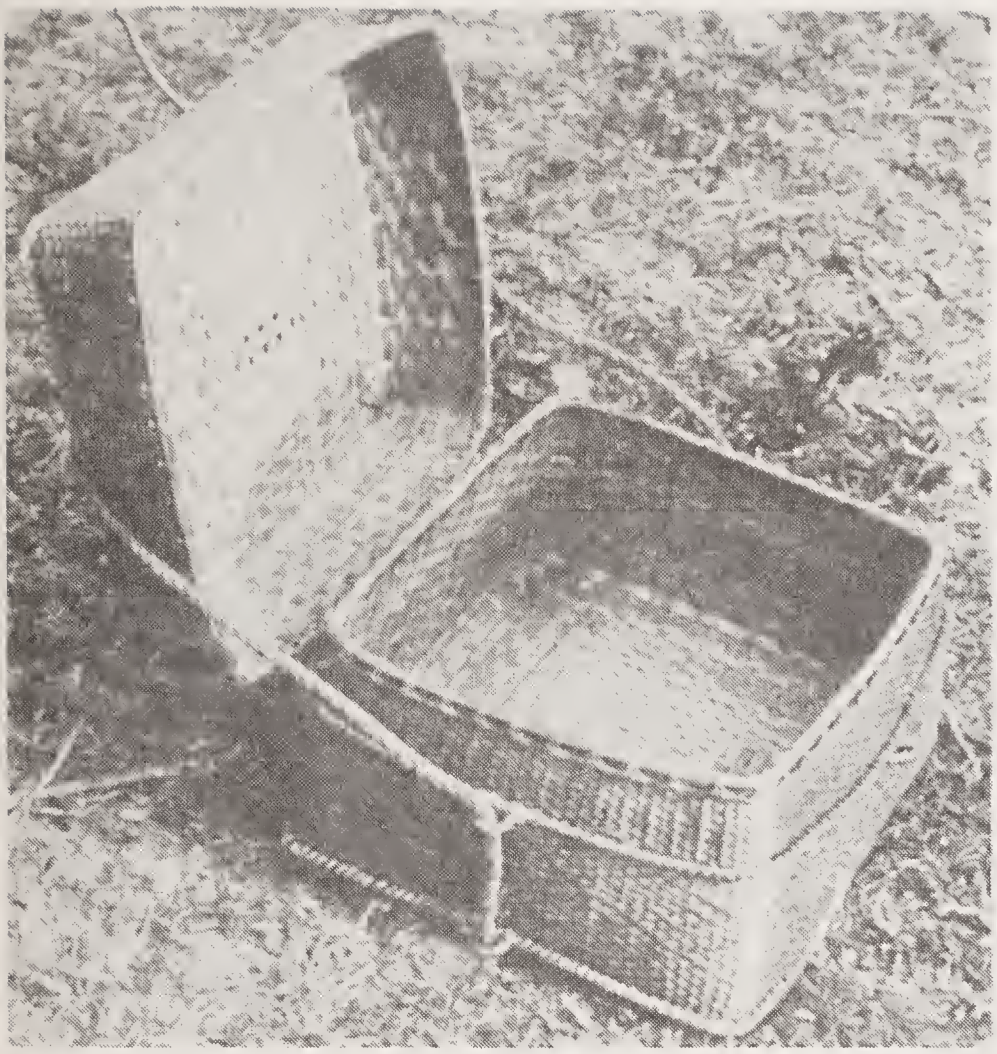
used by the Khasis to store clothes and valuables. The basket has a rectangular base 510 mm by 300 mm and is 320 mm in height including the lid. Both container and lid have an identical double-walled structure (fig. 573).

Structure and Construction

The base of the inner layer is formed by interlacing two sets of warp elements made of wide splits of bamboo woven in a twill structure. These are bent up around the perimeter of the rectangular base to be interlaced by a spiralling weft element made from wide bamboo splits. The outer layer is woven from thin outer splits of bamboo. The portion that overlaps the rectangular base is formed by two sets of warp elements weaving in an open tabby structure, as large square gaps are formed due to the space between consecutive elements of each set. The elements extending beyond the perimeter of the rectangular base are bent up and interlaced by a spiralling weft of bamboo outer split weaving in a closed tabby structure. This outer layer completely overlaps the sides of the inner layer.

Rim and Other Details

Both layers are sandwiched between rings of wide bamboo outer split and bound with split-cane binding (fig. 572). The split-cane binding is wrapped around a third split-bamboo element on top of the edge and it periodically passes over the sandwiching elements through both woven layers to hold all elements at the rim firmly in place. The base of the container and the top of the lid are strengthened by pairs of stout bamboo splints inserted into the weave, stitching both layers together and forming the diagonals of the



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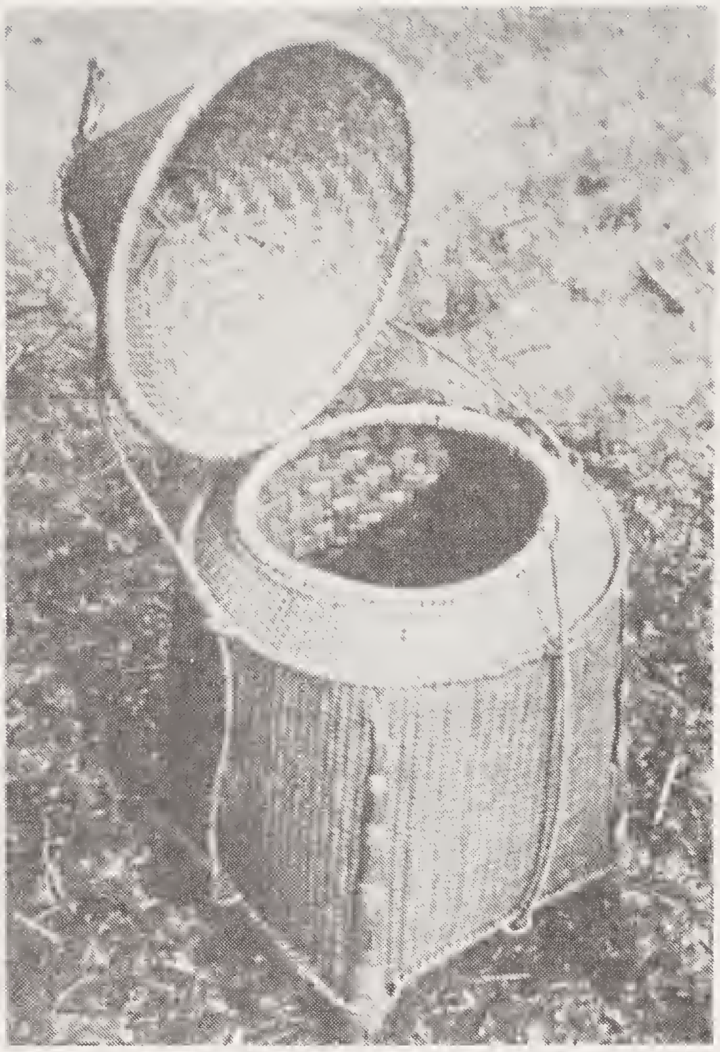

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574: A Dimasa Cachari storage basket.

575: Another Dimasa Cachari storage basket.

rectangle. The perimeter of the rectangle at the top of the lid is strengthened by a split-bamboo element wrapped by a split-cane binding which passes into the weave structure intermittently.

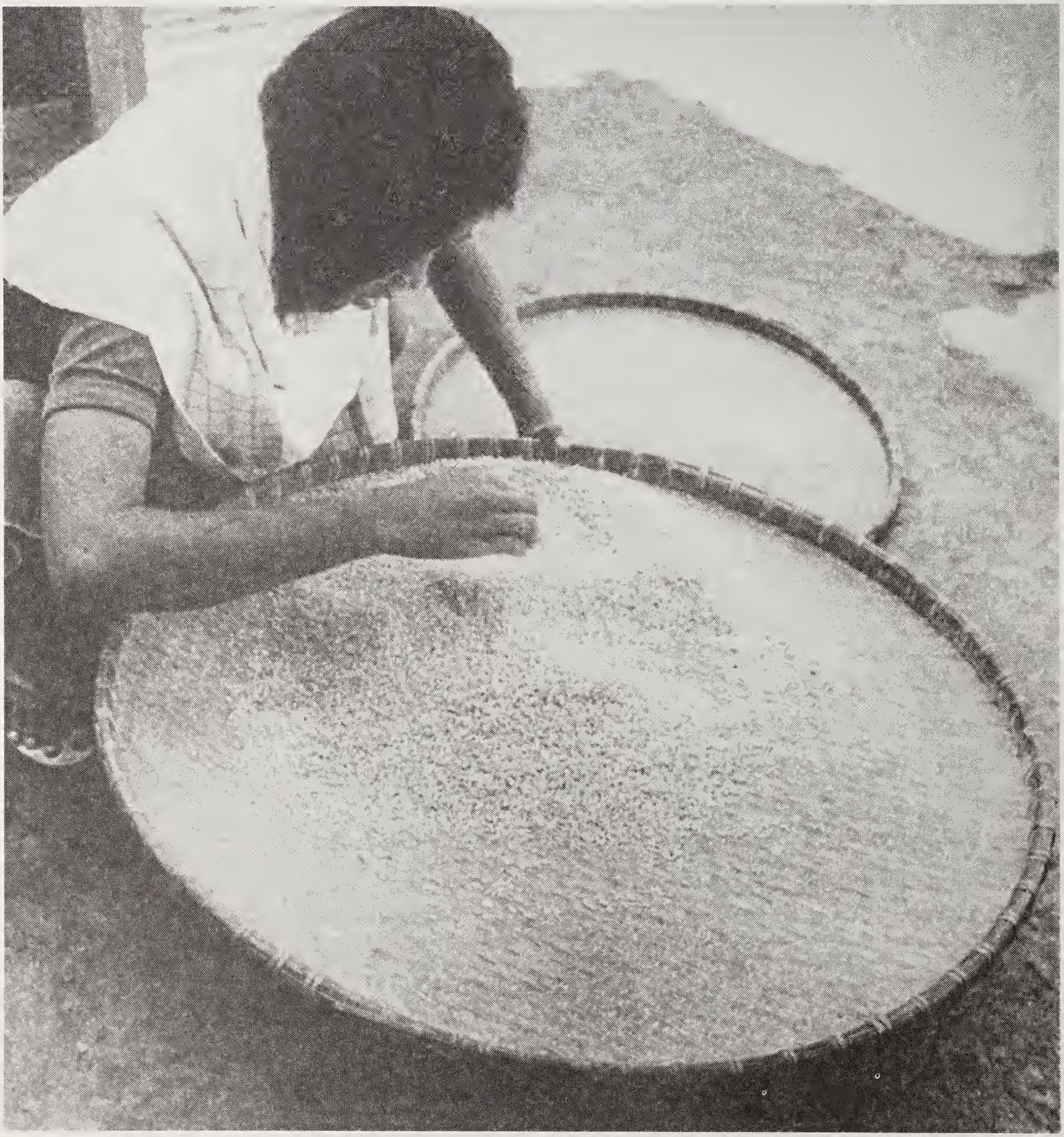
The lid overlaps the mouth of the container to rest on a similar ring of bamboo split wrapped in split cane and bound to the outer surface of the side walls of the container. The loops of split cane are bound to link this side-strengthening ring to the rim of the lid and these loops act as hinges linking the lid to the container. A hasp made of split cane which is wrapped around by split-cane binding is attached to the rim of the lid in front of the basket and a staple of a similar construction is attached to the side wall of the container in a corresponding position. Four legs shaped like spikes and made from lengths of whole bamboo are introduced into the side weave to extend below the base at the corners of the basket. These keep the woven base away from the ground.

Other Storage Containers

Several other storage containers for clothes and valuables were seen in the region with each tribe having evolved their own forms and structures to fulfil the same function. The Mizos use a basket called *thul.* These baskets, though shaped like their carrying baskets, have a double-walled structure and legs located at the corners of their square base. A lid shaped either like a semi-spherical dome or like a cone covers the mouth of basket.

The Dimasa Cachari basket is a tall square based prism on legs and is provided with a conical lid (fig. 574). The detailing used in the basket seen at Haflong is truly exquisite. Another basket from Haflong is made like a rectangular box, with a lid hinged on one side. A rope of twisted split cane is used ingeniously, both to hold the lid open and as a handle for carrying (fig. 575).

Winnowing Trays and Fans



Winnowing trays and fans are used all over India to sift grain from chaff. The products found in the northeastern region have their own distinct character and differ in size and form from state to state as well as between the various tribes.

Structure and Function

Both trays and fans are made basically by forming a woven mat into the desired shape. The trays have a strengthened rim that holds the mat all along the periphery of the form. The fans have one side of the mat free of the rim and the grain is poured out from this side.

The trays are generally used for drying grain, or are held horizontally and moved in a sidewise motion so that the grain is separated from the chaff. Both the trays and fans may be held horizontally and jerked upwards repeatedly to separate the grain. The fans are also used by tilting them gently towards the ground so that the grain, due to its weight, falls into a pile while the chaff, with the help of a gentle breeze, is blown into another pile.

Weave Structure

A common factor between all the winnowing trays and fans seen in the hill regions is the weave structure used in the mat. According to a craftsman, this weave has the strength required to absorb the impact load of the grain as it is being separated. It is a very closely packed weave, and generally the strips in at least one direction are made of the outer layer of bamboo. The winnowing fans from Assam and Tripura have a different weave structure which may be due to their smaller size.

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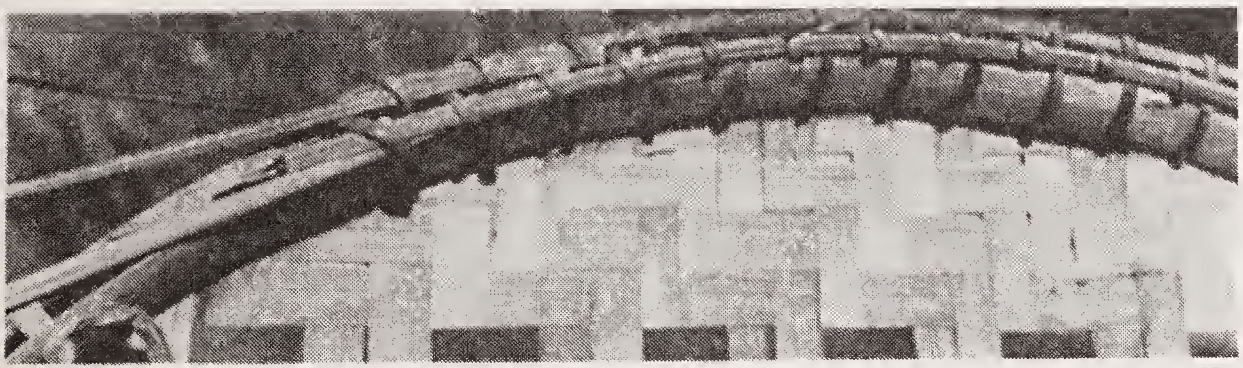

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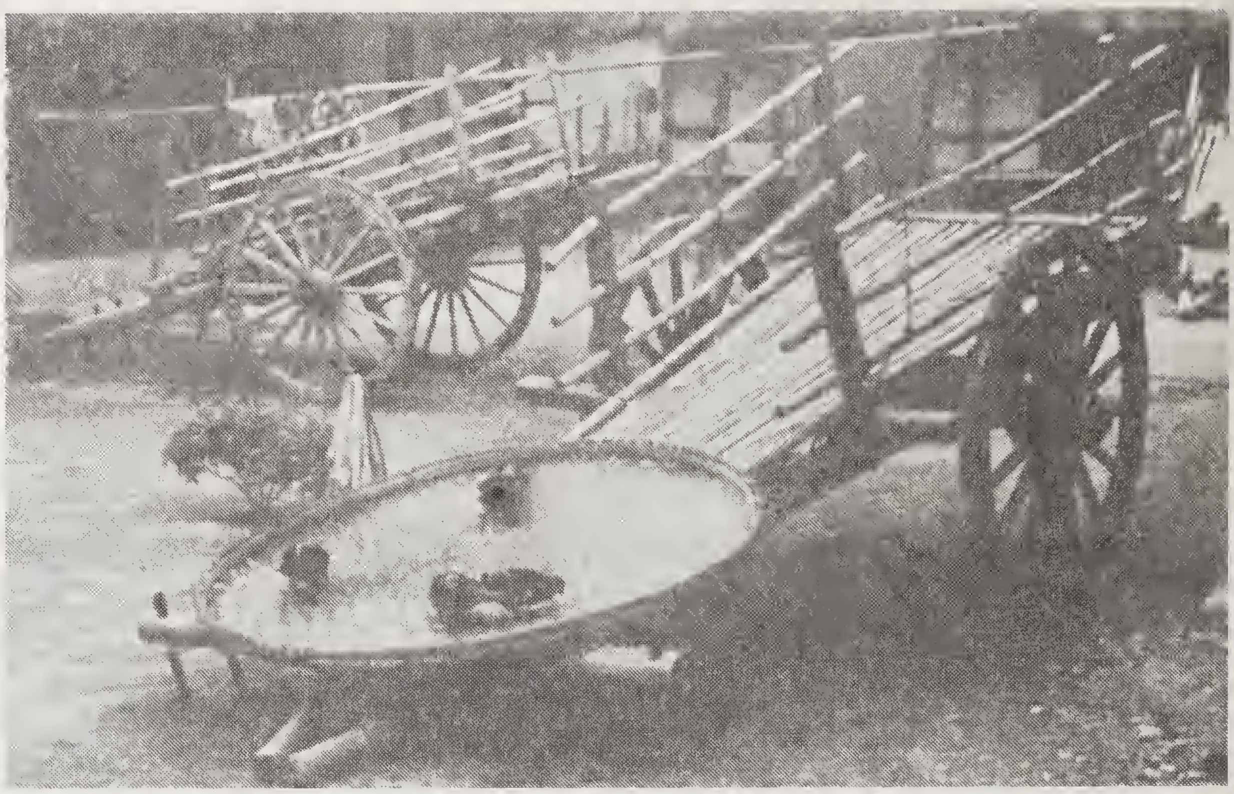
576: A Manipuri woman at Patsoi using a winnowing tray to clean rice.

577: The rim binding on a semi-finished Manipuri winnowing tray.

Winnowing Trays

The winnowing trays are made of a woven bamboo mat which is stretched within bamboo or cane rings (figs. 576-578). The rings which form the rim of the tray vary in size and shape according to the tribe that makes them. The perimeter of the mat is sandwiched between two concentric cane or bamboo rings, so that the rim is perpendicular to the mat. It is the fixing of a horizontal mat between vertical rings that allows the tension and strength of the mat to be maintained. The *dalla* from Assam, *dzharii* from Nagaland and the *thlangra* from Mizoram have similar constructions.



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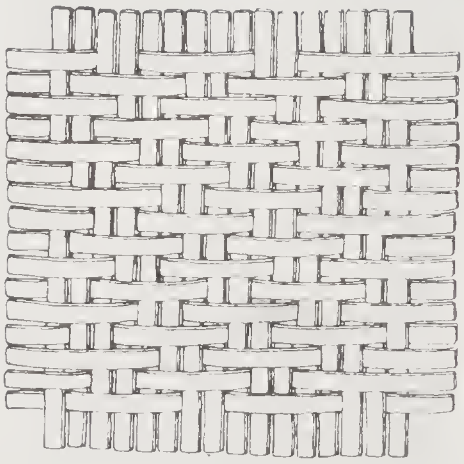

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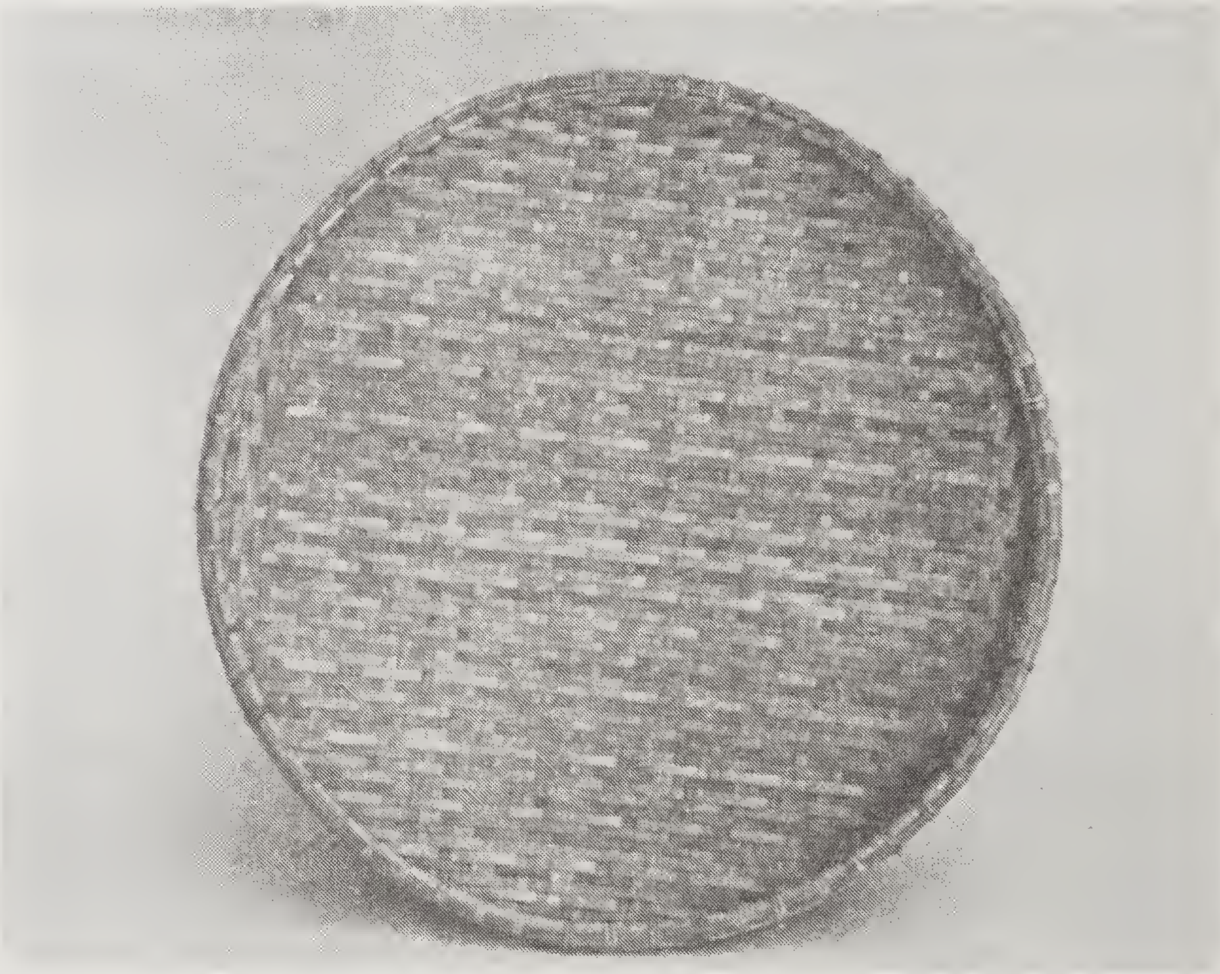
578: A Manipuri winnowing tray used to sun-dry grain.

579: The *dalla* from Assam as seen from above.

580: The weave structure of the *dalla*.



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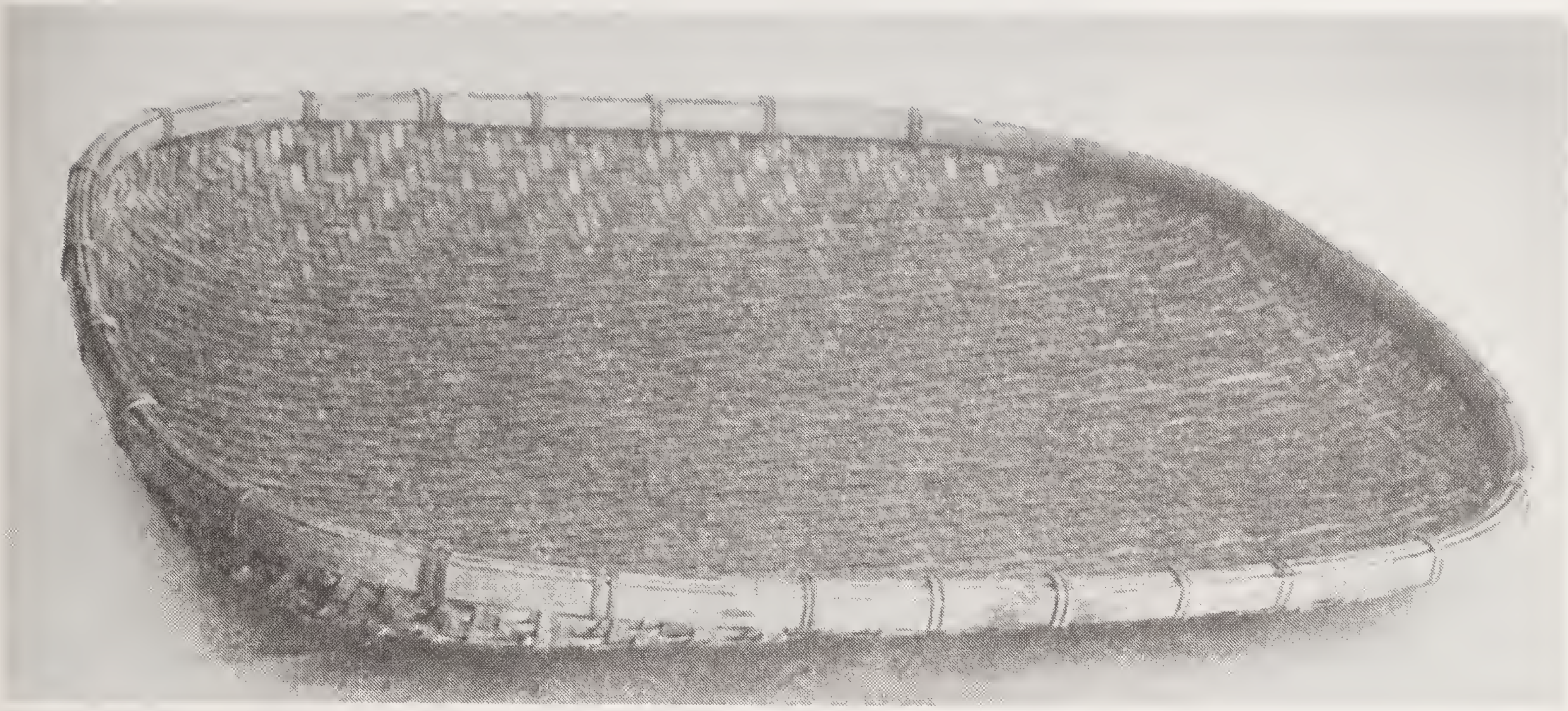
Dalla

The *dalla* from Assam is a circular winnowing tray (fig. 579). The mat is woven in a five-up-two-down weave, with each consecutive strip being staggered by two strips (fig. 580). Every third strip from one set uses the outer layer of bamboo. The mat is sandwiched between two wide rings of bamboo. A strip of cane covers the gap between the two bamboo rings. The three rings are bound tightly together to hold the mat in place. The *dalla* is very expensive and is made by a number of craftsmen in Kamrup District.

Dzharii

This is an oblong winnowing tray with rounded corners (fig. 581). It has the same weave as the *dalla*, but the structure on the periphery of the mat is a simple twill with shorter floats. This helps to maintain the slightly rounded



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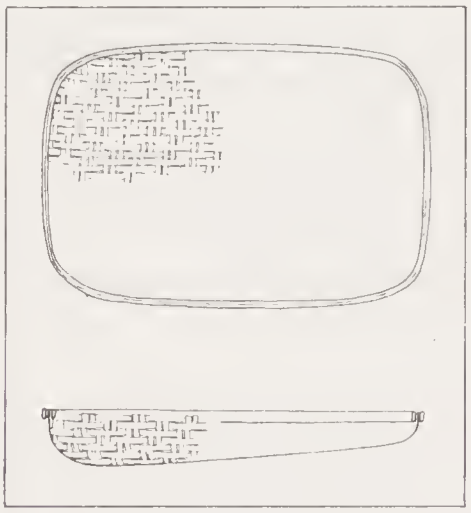

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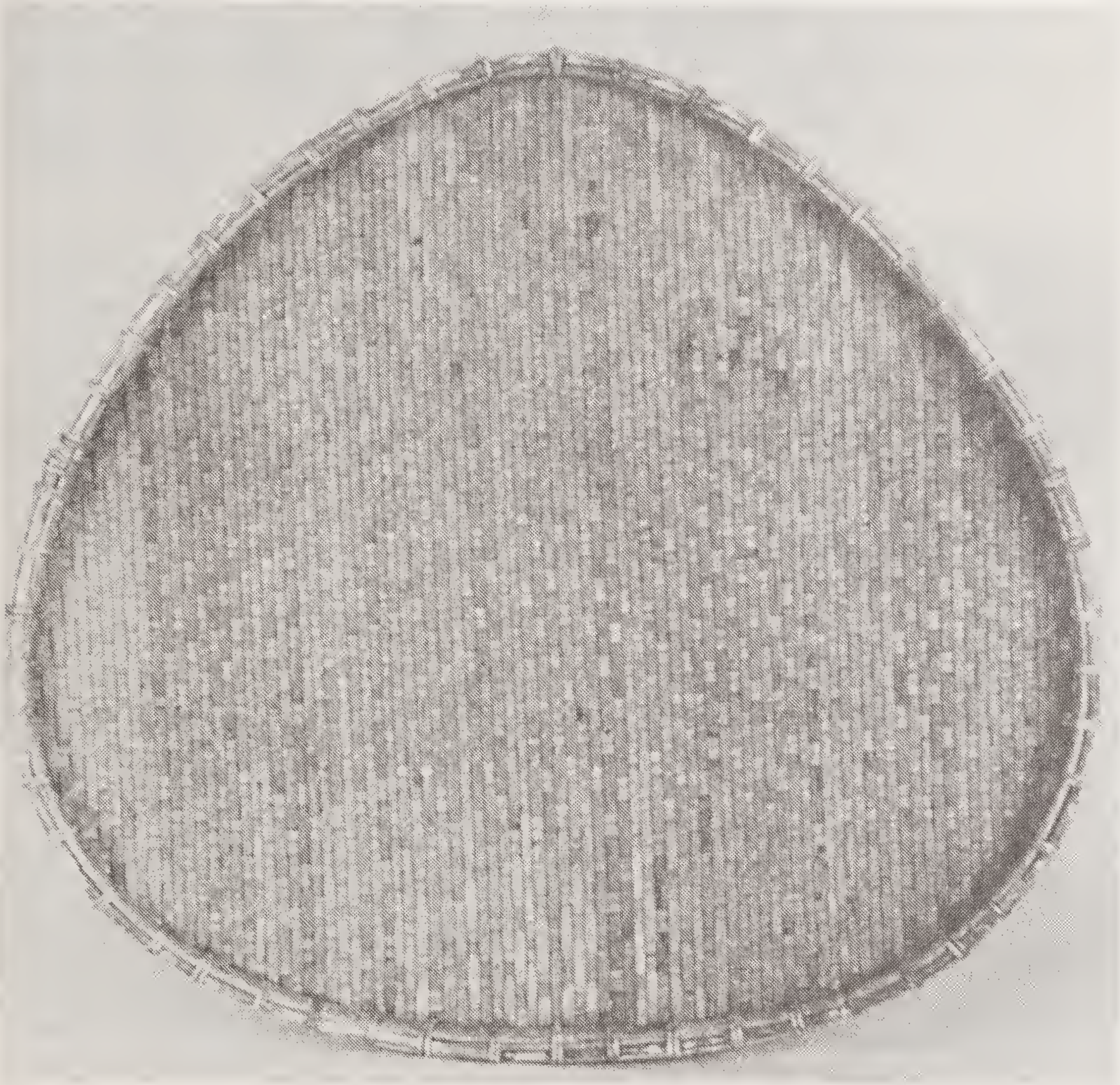
581: The *dzharii*, an Angami Naga winnowing tray.

582: The plan and sectional elevation of the *dzharii*, showing the asymmetrical depth of the tray.

583: The *thlangra*, a Lushai winnowing tray.

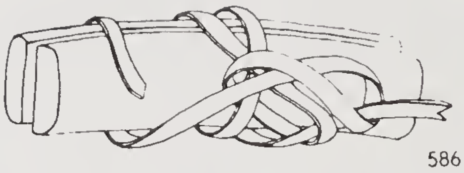


583

corners. The mat is held between two half splits of cane, which are bound together sandwiching the mat between them. This tray is slightly deeper than the *dalla*, and is made by the Angami Nagas (fig. 582).

Thlangra

The *thlangra* is a winnowing tray used by the Lushai tribe of Mizoram (fig. 583). The triangular *thlangra* requires manufacturing skills that only a few craftsmen have. The *rawthing* bamboo is used because of the resistance of thin strips of this bamboo to impact loads. The strips for the mat are cut from green bamboo, one set from the outer layer, and the other from the inner layer. The two thick strips used for the rim are also cut and bent and tied into the required triangular shape. All the strips are thoroughly dried before making the *thlangra* so that there is no shrinkage later. The dry strips are woven into a closely-packed mat.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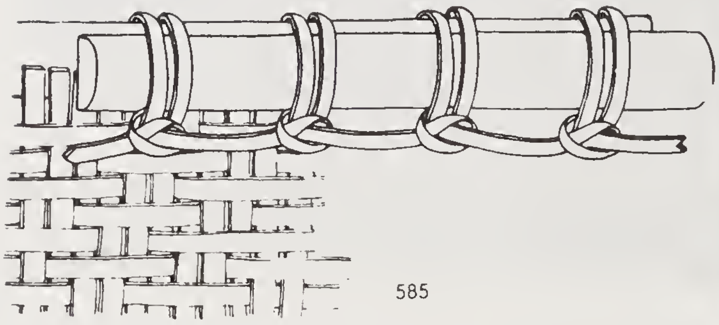
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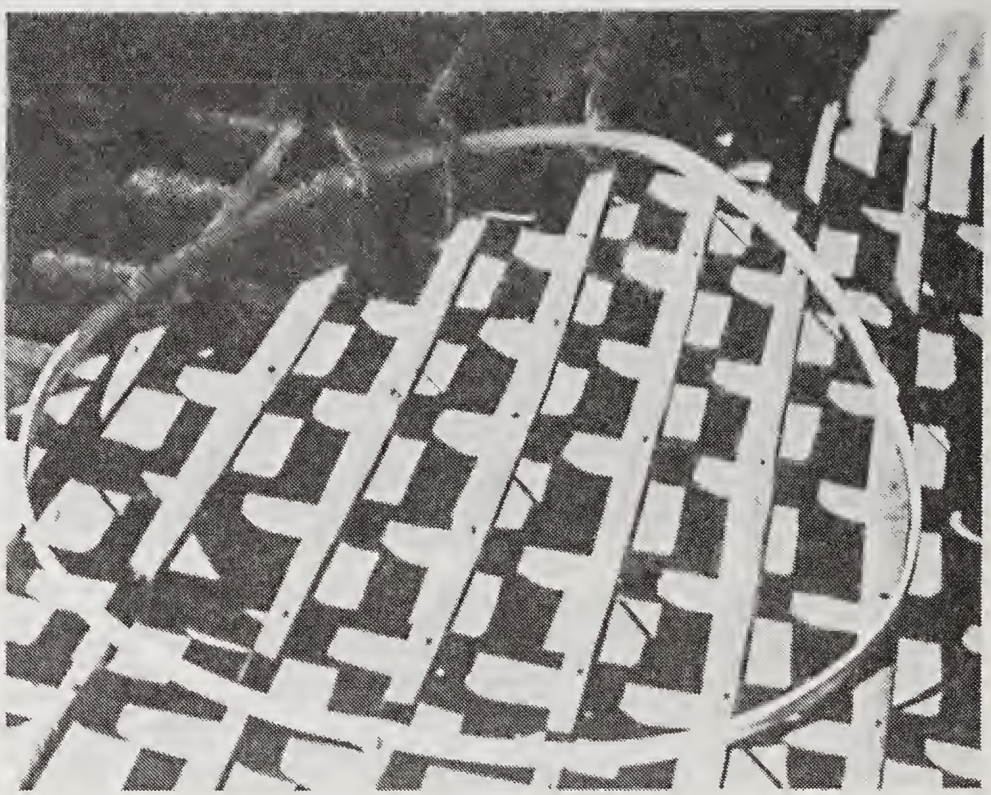
584: The wooden frame used to help stretch the mat onto the rim of the *thlangra*.

585: Detail of the rim binding.

586: The movement of the cane split used for the binding.

587: A Konyak Naga asymmetrical winnowing tray.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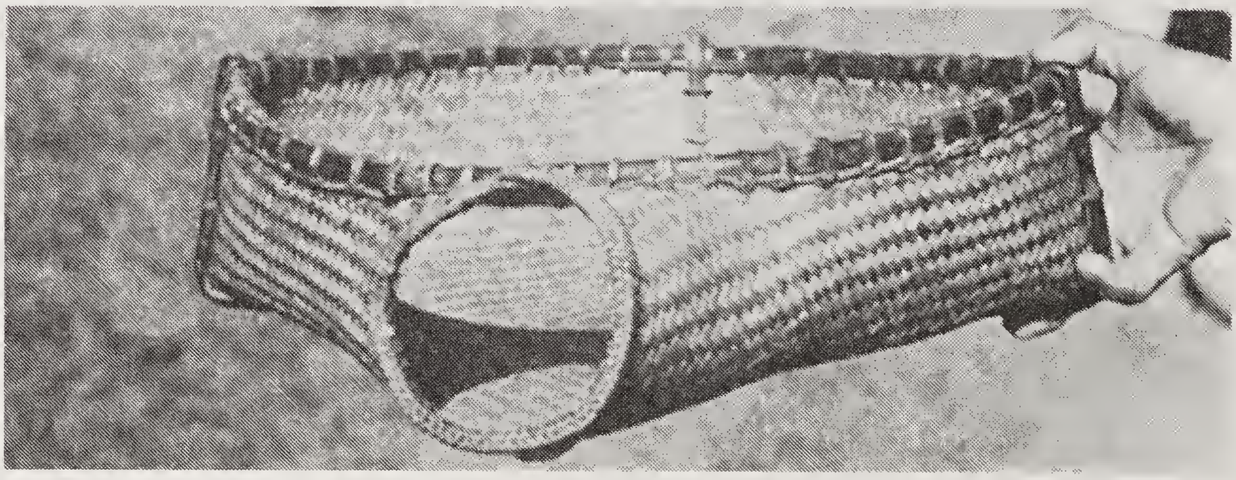
A wooden frame is used to stretch the mat on to the rim (fig. 584). The mat is placed on the frame and one ring, with the outer surface of bamboo towards the inside, is placed over the mat and tied on to the frame. The mat is pulled from under the ring and roughly tied at various places to the ring. The second ring with the outer layer of bamboo facing outwards, fits around the first one, sandwiching the mat between the two layers. The assembly is removed from the wooden frame and split-cane elements are used to bind them tightly together, with the mat between them (figs. 585, 586). The craftsman's skill lies in tensioning the mat evenly all over. The equal sides of the isosceles *thlangra* are held in the hand when it is being used. The outer splits run perpendicular to the isosceles triangle formed by the rim. This seems to be the orientation in which the mat is strongest.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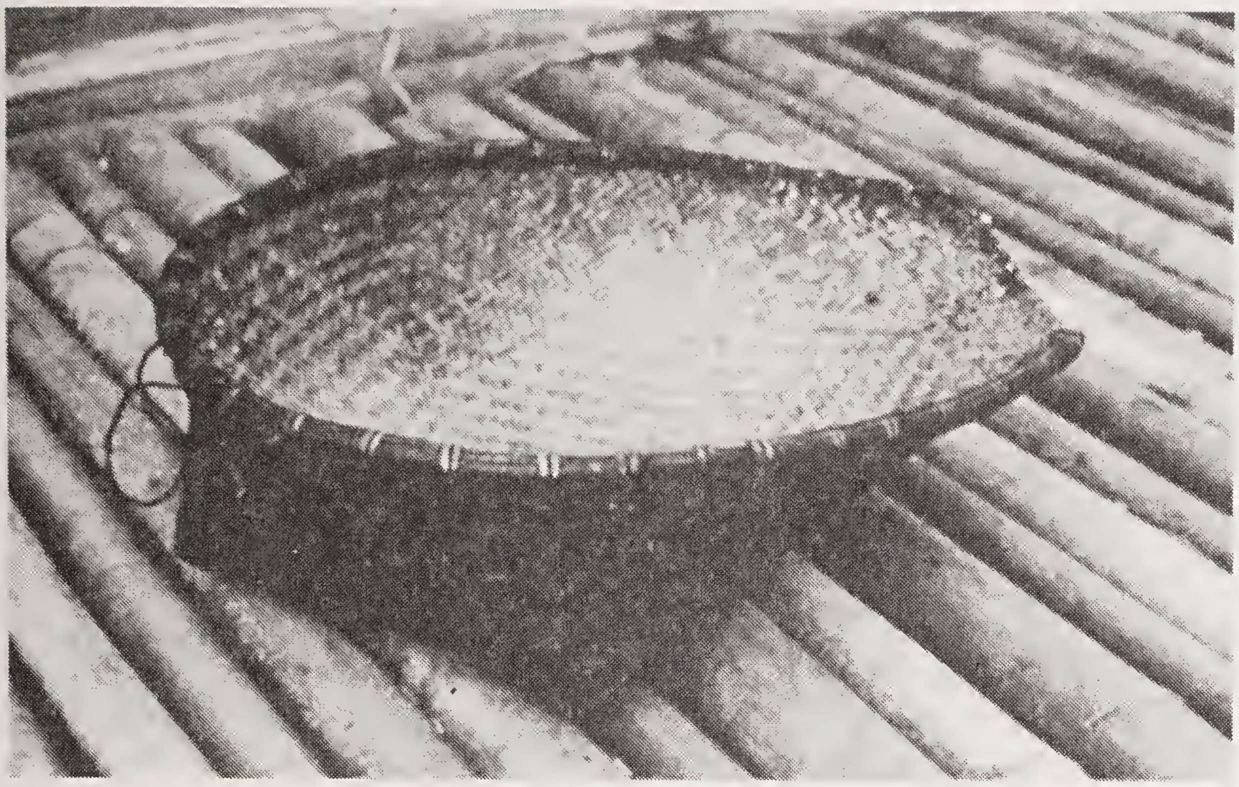
Winnowing Tray from Mon District

Asymmetrical winnowing trays are made by the Konyak Nagas in Mon District of Nagaland. One example was made like a shallow square-based basket with the weave elements parallel to the diagonals (fig. 587). One corner was elongated along the diagonal and bent to create a short cylindrical spout through which the grain is poured out of the tray. The rim just above the spout was strengthened by a ring of cane. The corners were also



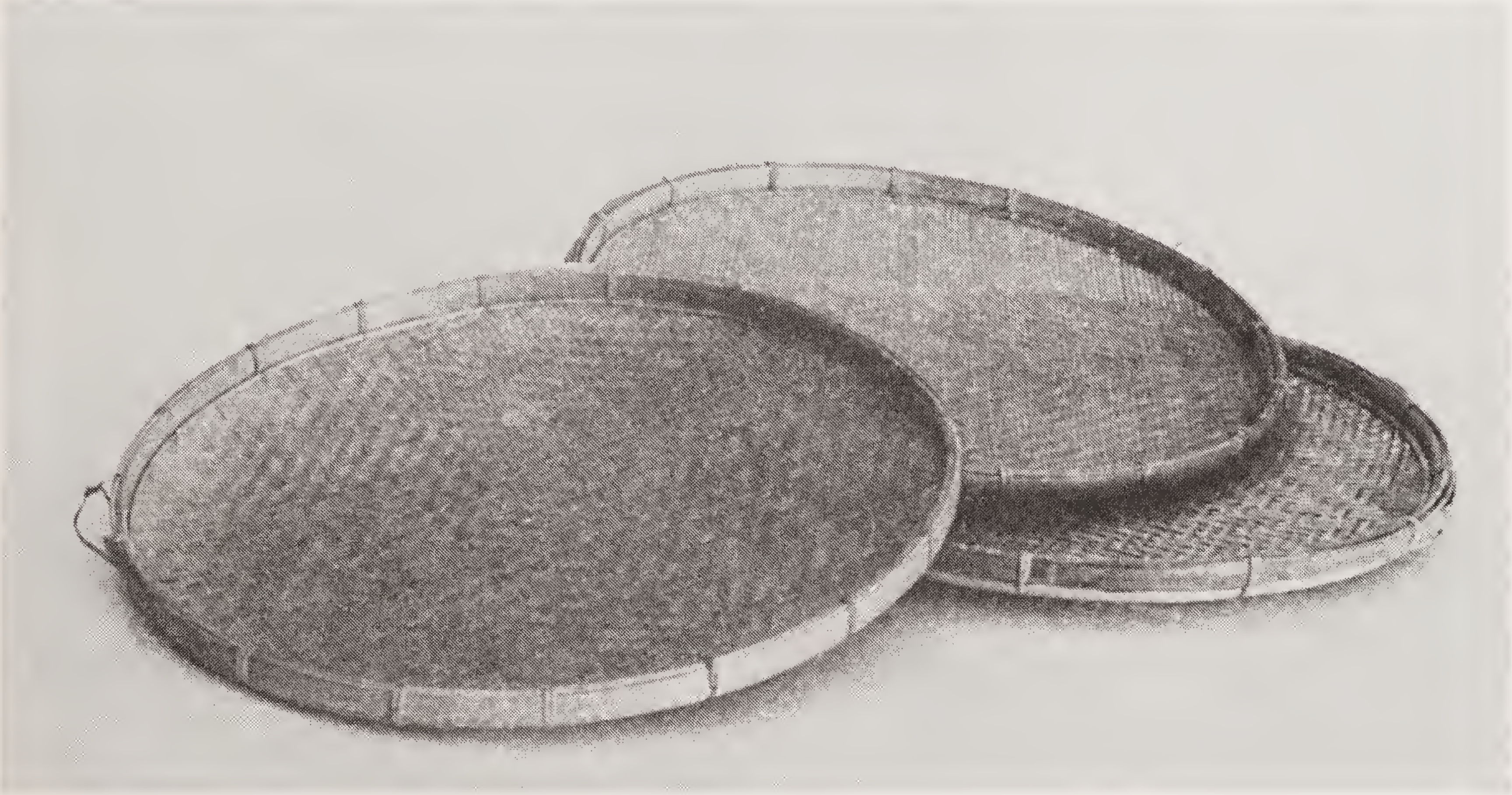
588

588: A variation of the asymmetrical Konyak Naga winnowing tray.

589: *Chalanis*, the dry or wet strainers from Assam.

strengthened by cane splits. One split began inside the corner opposite the spout and was bent over the rim to lie along the diagonal underneath. It ended at the rim of the spout. Two cane splits were used to strengthen the other two corners in a similar manner so that they ended short of the centre of the underside of the tray. The rim of the spout was strengthened by a decorative cane binding.

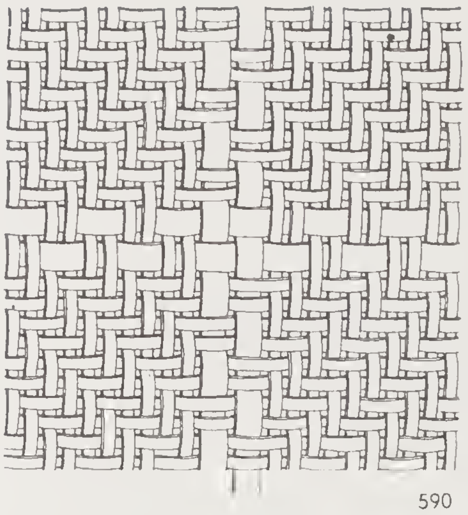
A variation of this winnowing tray seen in the same village had one corner flattened out so that the grain was poured from an edge perpendicular to the diagonal (fig. 588). The U-shaped rim was strengthened with cane.



589

Chalani

Chalanis are sieves used as dry or wet strainers to sift grain or wash vegetables (fig. 589). The basic structure of the *chalani* is a mat stretched within a stiff circular rim, very similar to the structure of the *dalla.* The main difference lies in the structure of the mat, which in the case of the *chalani* is made with an open weave.



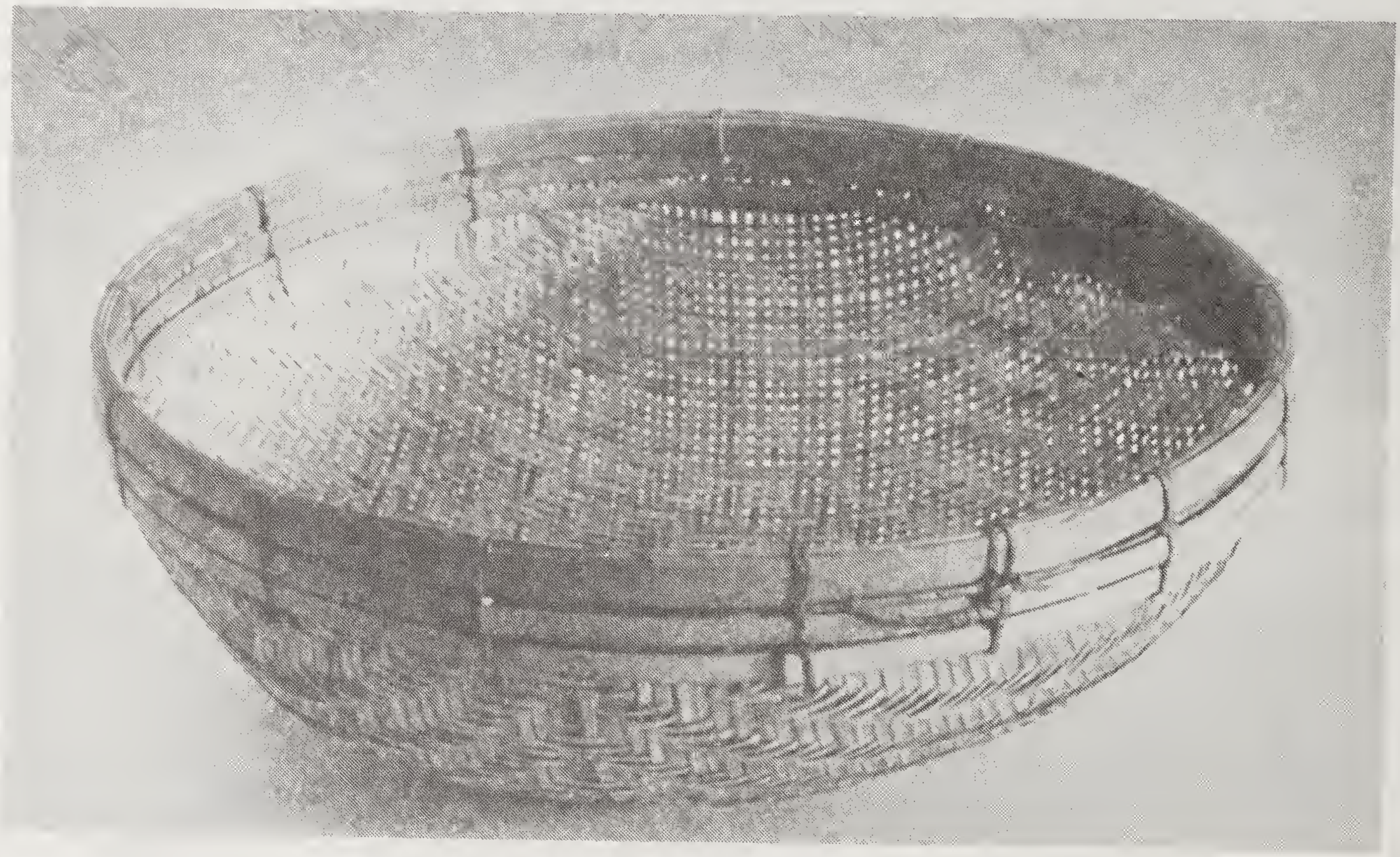
590

Mat Weave

The size of the gaps between the elements determine the function of the *chalani*. Generally, the width of the strips used increases with the width of the gaps required. A square mat is woven from the centre outwards and two pairs of wide bamboo strips, one in each direction, are interlocked in a cyclic pattern (fig. 590). Subsequently, narrower bamboo strips are woven on each side of the first four, in a twill weave.

Rim

The edges of the mat are woven with wider strips in a closely-packed twill weave. The mat is stretched and sandwiched between two rings of bamboo and the portion which protrudes above the top of the rings are cut off. The rings are tied together with a cane split passing through the mat. This method is used to produce both coarse and very fine sieves.



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590: The weave structure at the centre of the *chalani*.

591: The *korahi*, from Assam, used to wash grain and vegetables.

592: The *korahi* resting on its rim.

593: The mat is pressed into a hole in the ground to obtain a semi-spherical shape.

594: A conical strainer used by the Dimasa Cacharis.

595: Another Dimasa Cachari strainer, similar to that used by several other tribes of the region.

596: A Dimasa Cachari sieve tray seen held against the light.

Korahi

Other forms of the *chalani* are made in Assam. These are semi-spherical dome-shaped sieves called *korahi*, used to wash grain and vegetables (figs. 591, 592). These may be in different sizes ranging from less than 250 mm in diameter and 100 mm in depth to over 400 mm in diameter and 155 mm in depth.

Structure and Construction

As in the *chalani*, the basic structure of these sieves is a mat form held between two bamboo rings at the rim. The mat is woven like the *chalani*, in an open-twill weave which forms a pattern of concentric squares. It is then moulded into a semi-spherical dome shape by pressing it into a hole in the ground, which acts as a mould. The mouth of the hole determines the circumference of the basket, and the depth to which the mat is pressed determines its form. The outer ring of bamboo, previously prepared to the required size, is placed behind the edges of the mat which is then eased to fit evenly around the ring. The gaps between weave elements allow a certain movement of the strips, in relation to each other, which is necessary to obtain a smooth curve. The inner ring is then put in place and the two rings are tied together sandwiching the edges of the mat between them (fig. 593).

592

593

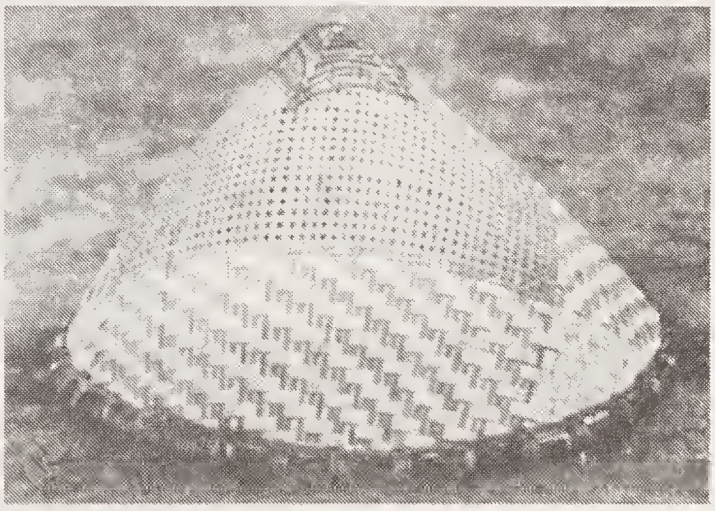
Rim

The protruding corners of the mat are cut off and a thin strip of bamboo is tied on top of the two bamboo rings to finish the edge neatly. Sometimes additional rings of bamboo are tied just below the rim to strengthen it further. This method of moulding a mat makes it possible to obtain very smooth curvatures.

595

Other Strainers

Most tribes in the northeastern region make their strainers from bamboo splits. Several of these are made in a conical form with the area around the tip of the cone woven in an open structure. The area near the rim is invariably in a closed-weave structure. Other strainers are made like dish-shaped trays with the open structure in the centre of the tray (figs. 594-596).



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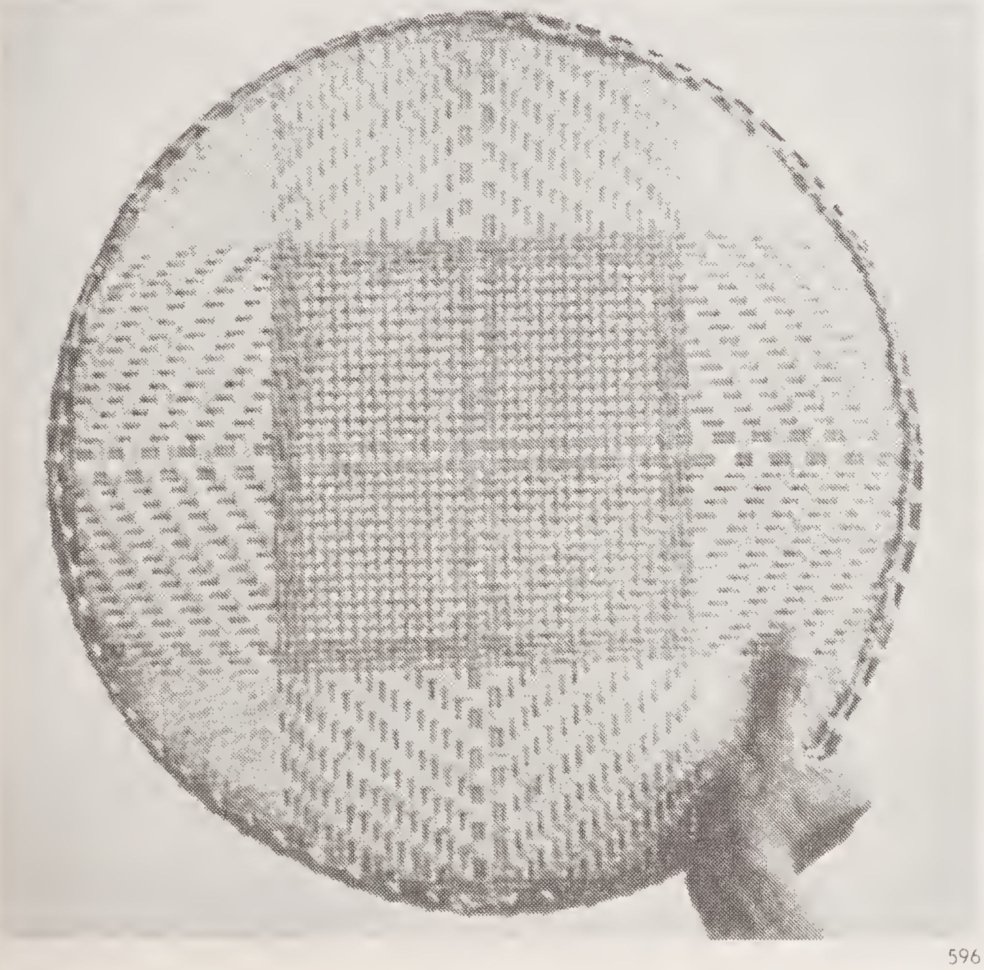

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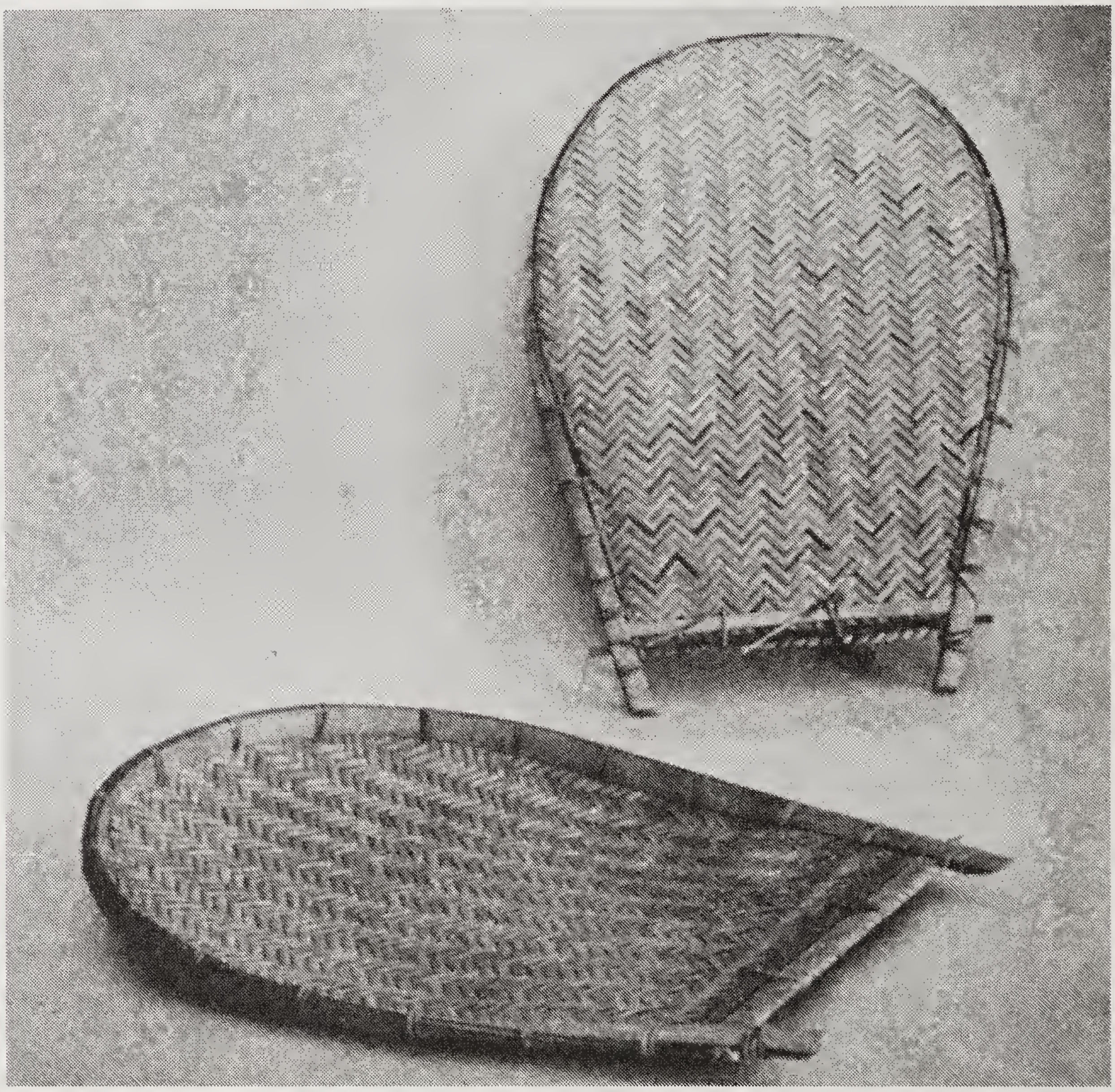
Winnowing Fans

These are basically U-shaped trays, the length being more than the width. They are held horizontally in both hands so that the back or arch of the U is near the body. The fans have a maximum depth at the back, gradually flattening into a horizontal surface in the front, so that the grain can be poured out easily.

There are shallow and deep winnowing fans. The former are made by stretching a mat within a rim made of bamboo splints. The maximum depth is determined by the width of the strengthened rim, which is perpendicular to the mat at the back. Along the sides, the splints are warped to lie almost horizontal in the plane of the mat in front. The difference in the deeper winnowing fans is that the mat is cut, folded and stitched to create a greater depth at the back.

597: The *kulha* from Assam.

598: Another type of *kulha*.



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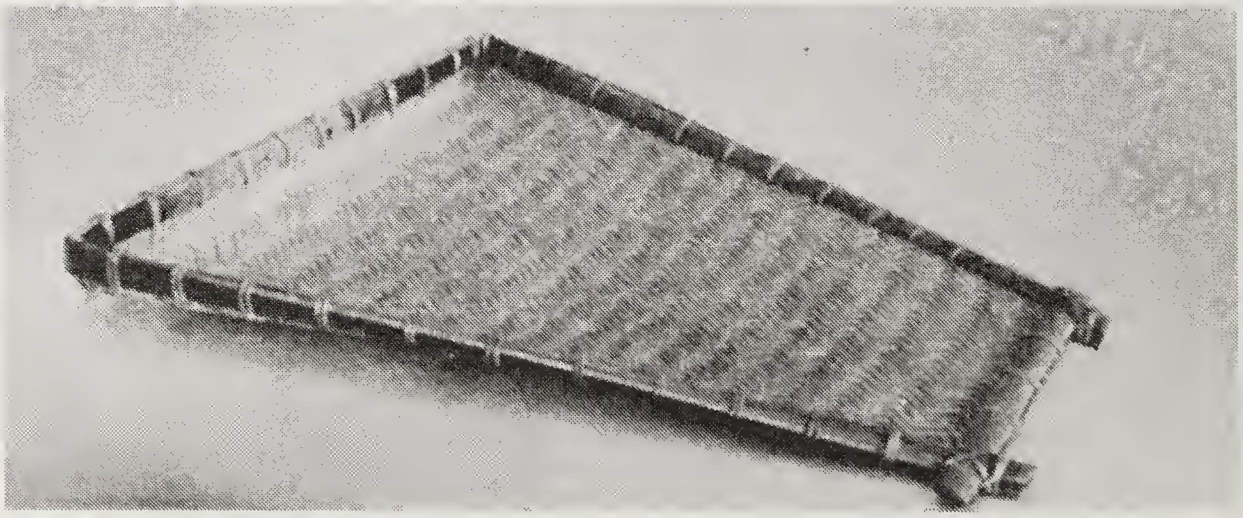

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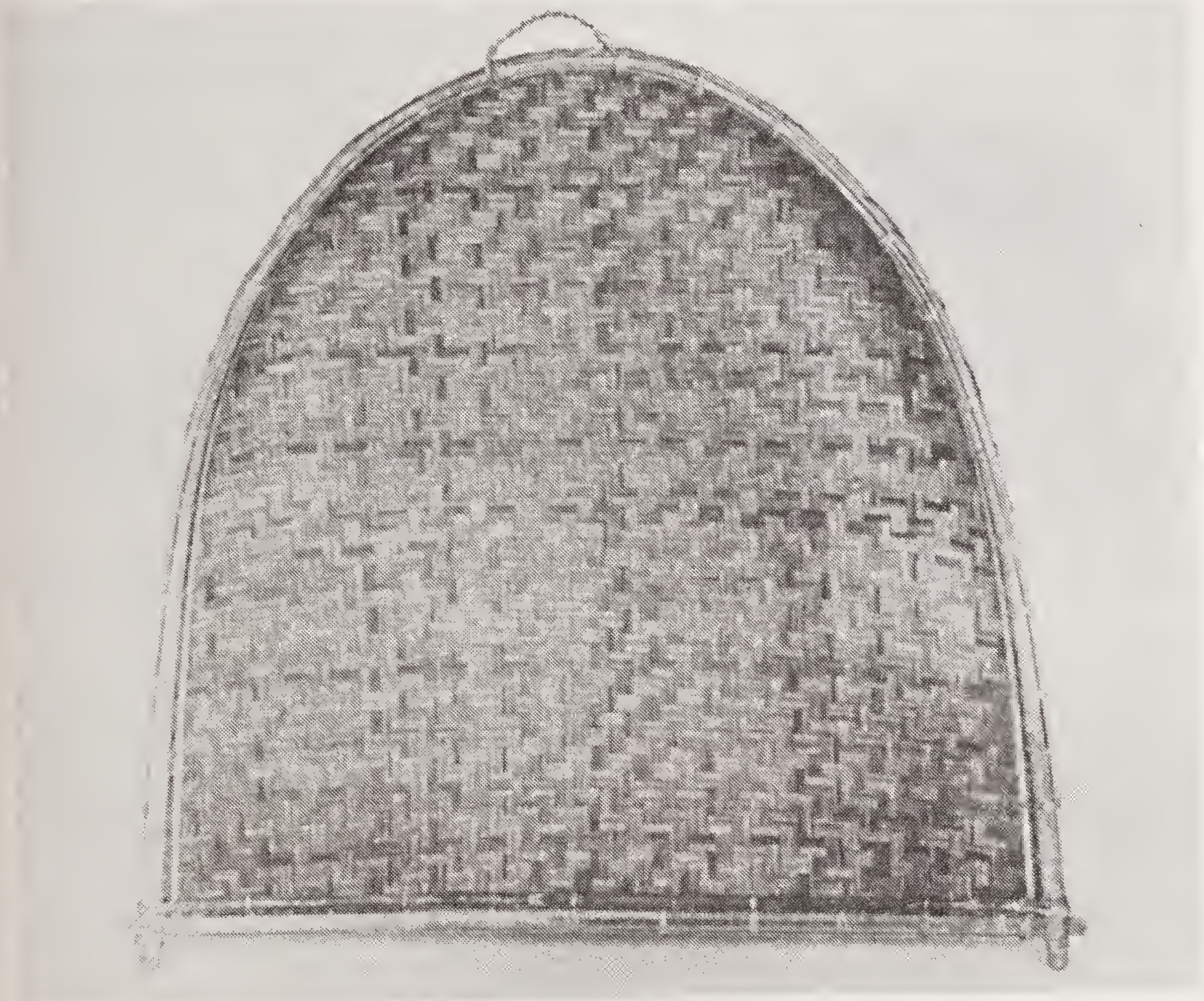
Kulha

The *kulha* from Assam typifies the shallow winnowing fans (fig. 597). The weave of the mat runs diagonally to the axis of the tray. The rim is strengthened by sandwiching the edges of the mat between two bamboo splints which are bent to the desired shape. In this case it is U-shaped with the front end narrower than the back.

Another sample is trapezoidal in shape, with the front and back edges parallel to each other and perpendicular to the axis of the tray (fig. 598). The sides are created by heating and bending the thick bamboo rim in an acute angle to the back. The splints are bound together with cane splits. The difference between these samples lies in the finishing of the front edge.

The weaving of the mat is begun from the front edge. Strips of bamboo are folded such that the two arms of the fold lie at right angles to each other and diagonal to the folded edge. The strips are then woven to produce the mat. The folded edge is strengthened with two bamboo splints. A notched bamboo split introduced parallel to the edge holds the two arms in position.

Another tray is begun in a similar manner, but at the start the strips are folded over an additional horizontal bamboo split before they are woven into the mat. This edge is further strengthened by two additional bamboo strips. The front of the trapezoidal tray has a simple cut edge strengthened in a similar manner.



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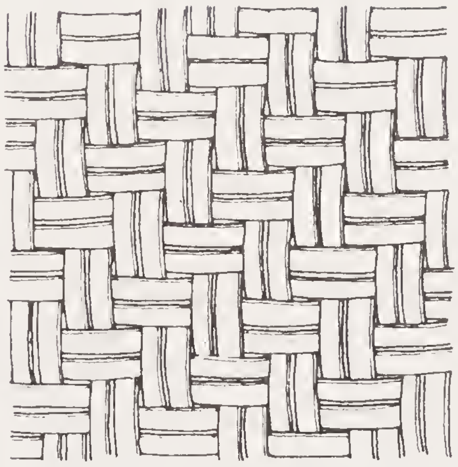

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599: A winnowing fan from Gohpur in Assam.

600: The weave structure of the mat.

Winnowing Fan from Gohpur

The winnowing fan from Gohpur on the north bank of the Brahmaputra has a different twill weave structure (figs. 599, 600). The strips are parallel and perpendicular to the axis of the tray. The rim is U-shaped, similar to the other fans, and one split of cane bent around both sides of the front edge holds the arms in position.

The deeper winnowing trays are generally made from mats that are folded and stitched at the corners to create the required depth.

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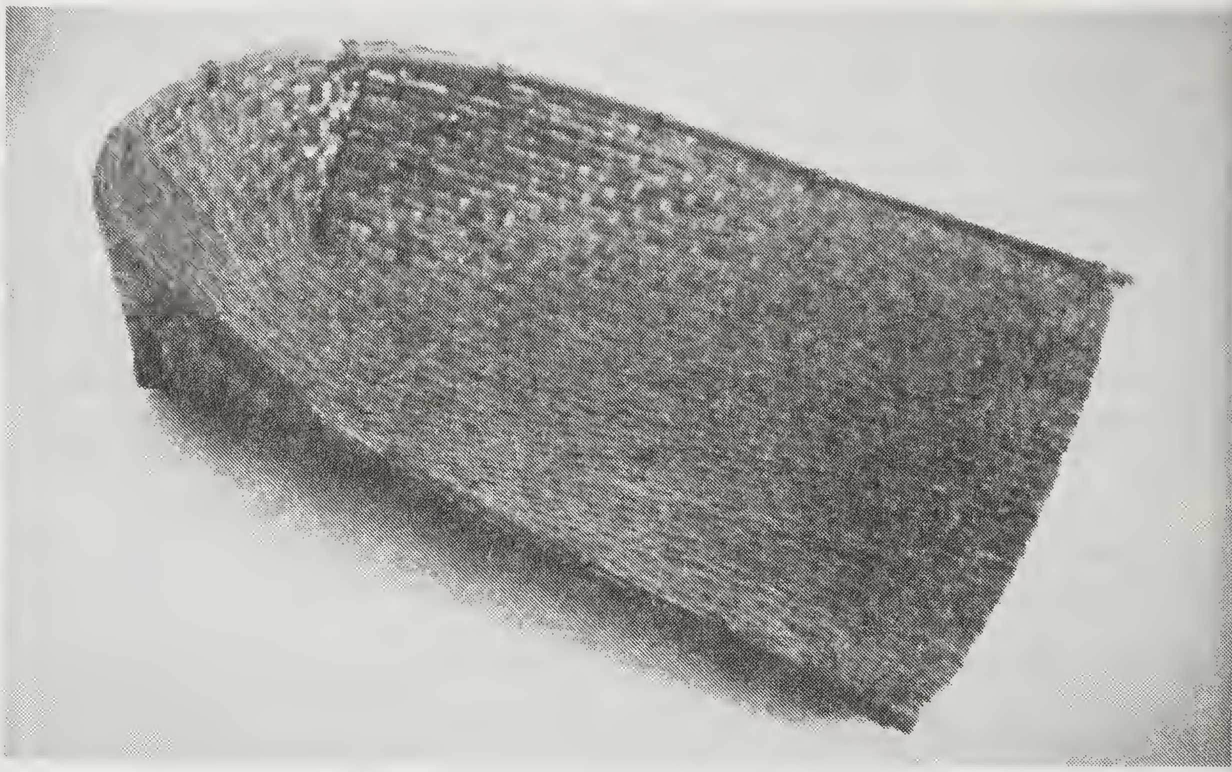
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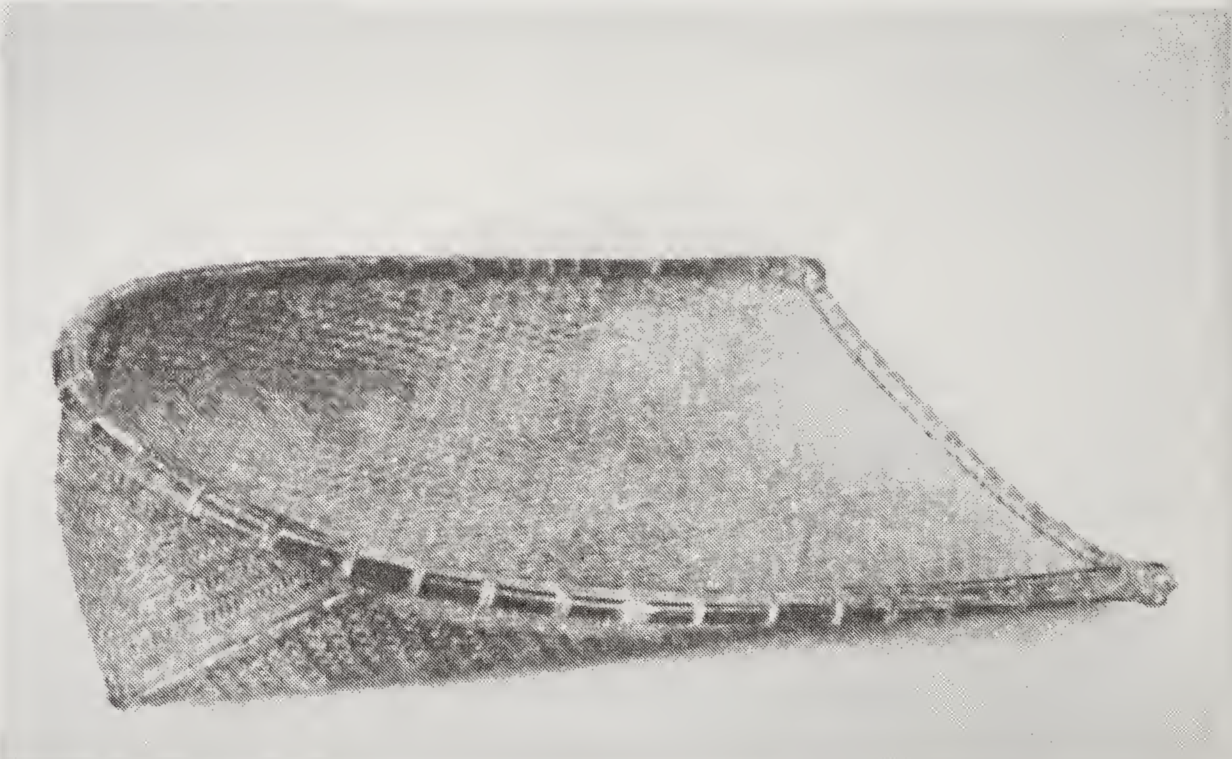
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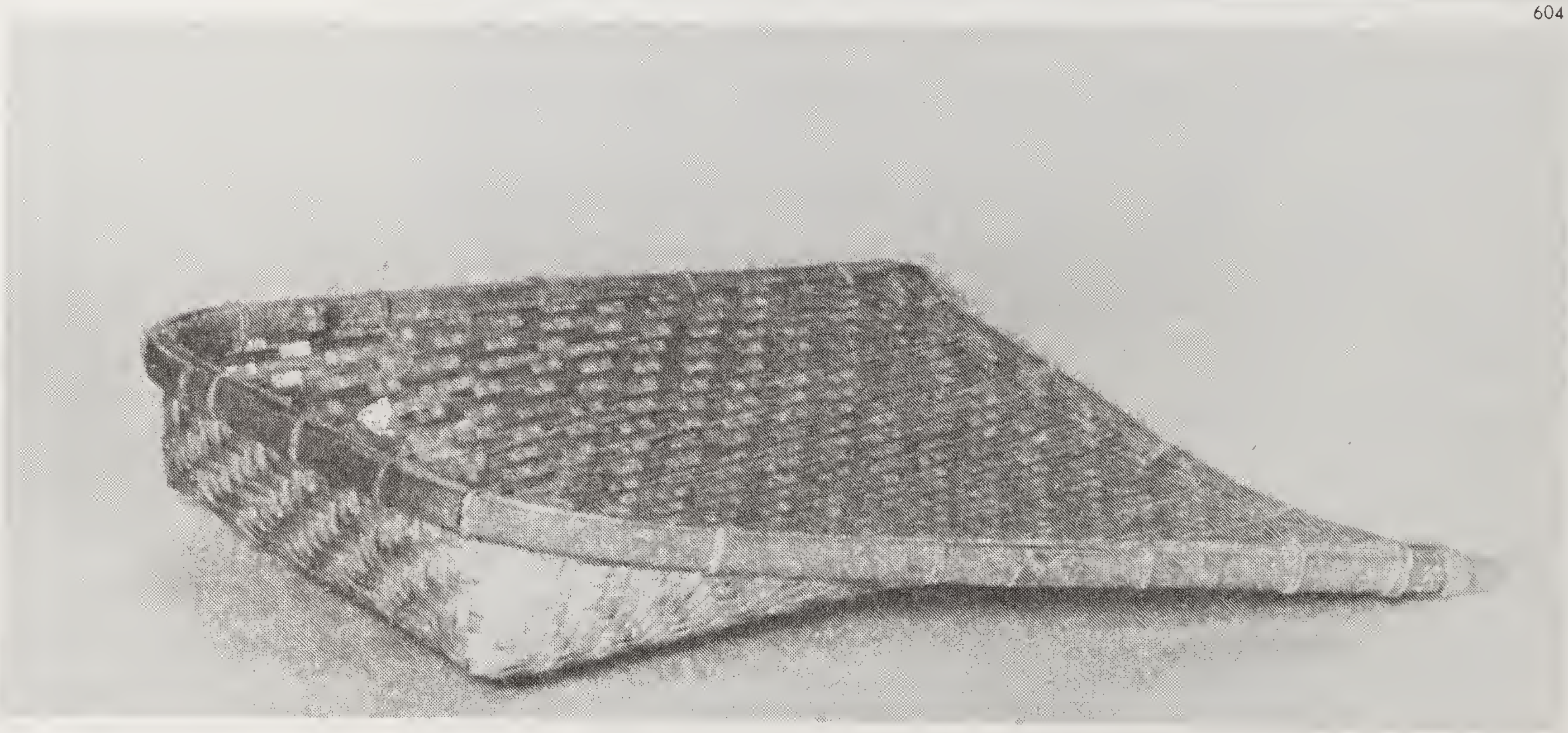
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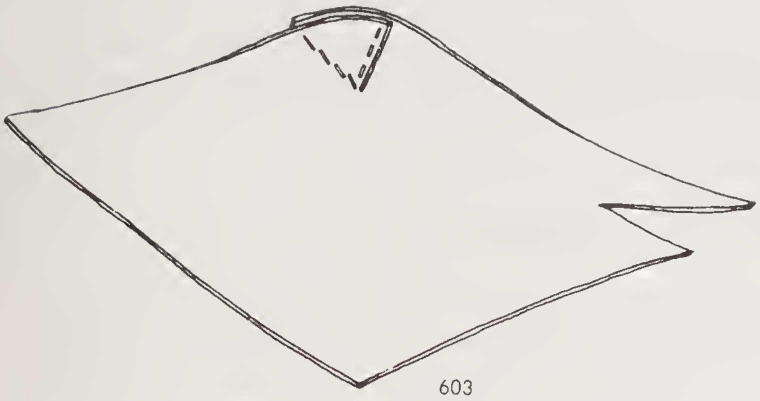

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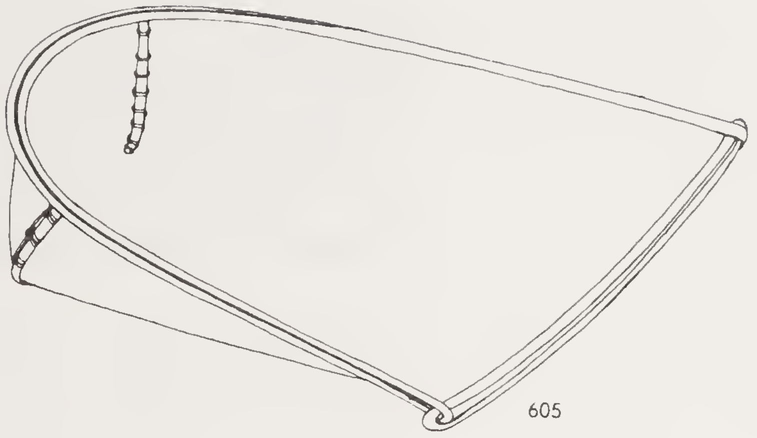

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Leherzu

The *leherzu* from Nagaland is fabricated from a rectangular mat woven in a four-up-one-down twill pattern (fig. 601). The outer splits are used parallel to the axis, perpendicular to the front edge of the mat. One of the shorter sides of the rectangle is folded upwards, determining the depth of the tray. The corners are cut and folded and stitched onto the side with a cane split (figs. 602, 603). Three edges of the folded mat are sandwiched between two outer splints of bamboo bent into an U shape. Three or four narrow splits of bamboo fill the gap between the two splints, covering the edge of the mat. All these elements are bound together with cane splits. At the front of the tray, the warp splits which are perpendicular to the edge are folded back over the last weft strip. The ends of the splits are reintroduced into the weave on the lower surface of the mat. This edge of the fan is not strengthened.

Vankhaong

Vankhaong, the winnowing fan from Thinsa village in Arunachal, is made by the Nocte tribe (fig. 604). It is constructed like the *leherzu,* the main difference lying in the edge strengthening. The cut ends of the fold on the inside are covered by a half split of cane which is tied through the mat by a thin cane split. The diagonally cut corners on the outside are covered by a single half split of cane that is tied over one fold, across the base of the fold at the bottom and up to cover the cut edge on the other side. The ends of the cane split lie between the rim-strengthening members. The rim is strengthened by a half split of a thicker cane beginning on the inside top of the arch. It is folded back on itself and continued all along the outside sandwiching the edge of the mat. At the other front corner it is folded onto the front again to overlap at the start. The two ends are cut at an angle so that the overlapped portion has the same thickness as the rest of the rim. The front edge of the tray is strengthened in a similar manner (fig. 605). The two rims are interlooped at the front corners. The mat in this winnowing fan is also strengthened by three additional cane splits running through the weave along the central axis.

Winnowing Fan from Shillong

The winnowing fan from Bara Bazaar, Shillong, is made using the simple basket-forming technique (fig. 606). The warp elements made from outer splits are parallel to the axis of the fan. These are bent vertically at the back of the fan to provide the required depth. On either side of the width required at the back, warp elements beginning at the front edge of the tray run along the length and are bent at right angles to weave into the vertical warp elements, thus creating the back vertical surface (fig. 607). The fan is woven in the five-up-two-down structure except at the vertical surface where it becomes a closer twill weave.

601: The *leherzu*, an Angami Naga winnowing fan.

602: Detail of the cut and folded corner.

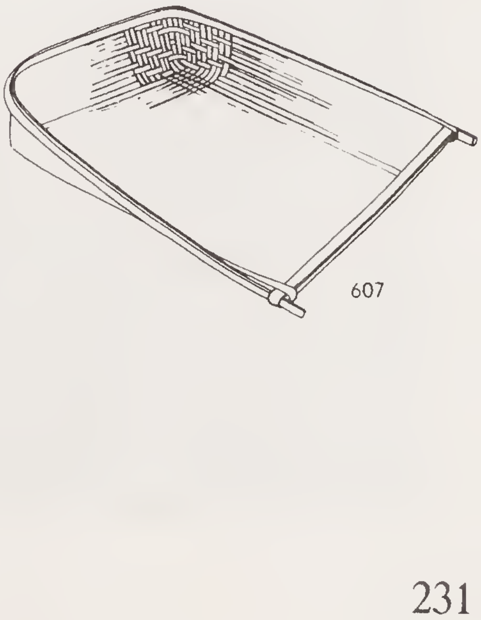
603: The way in which the mat is cut and folded to form the *leherzu*.

604: The *vankhaang*, a Nocte winnowing fan.

605: A diagram showing the rim and corner strengthening of the *vankhaang*.

606: A Khasi winnowing fan.

607: The simple weaving technique used to form the Khasi winnowing fan.



607

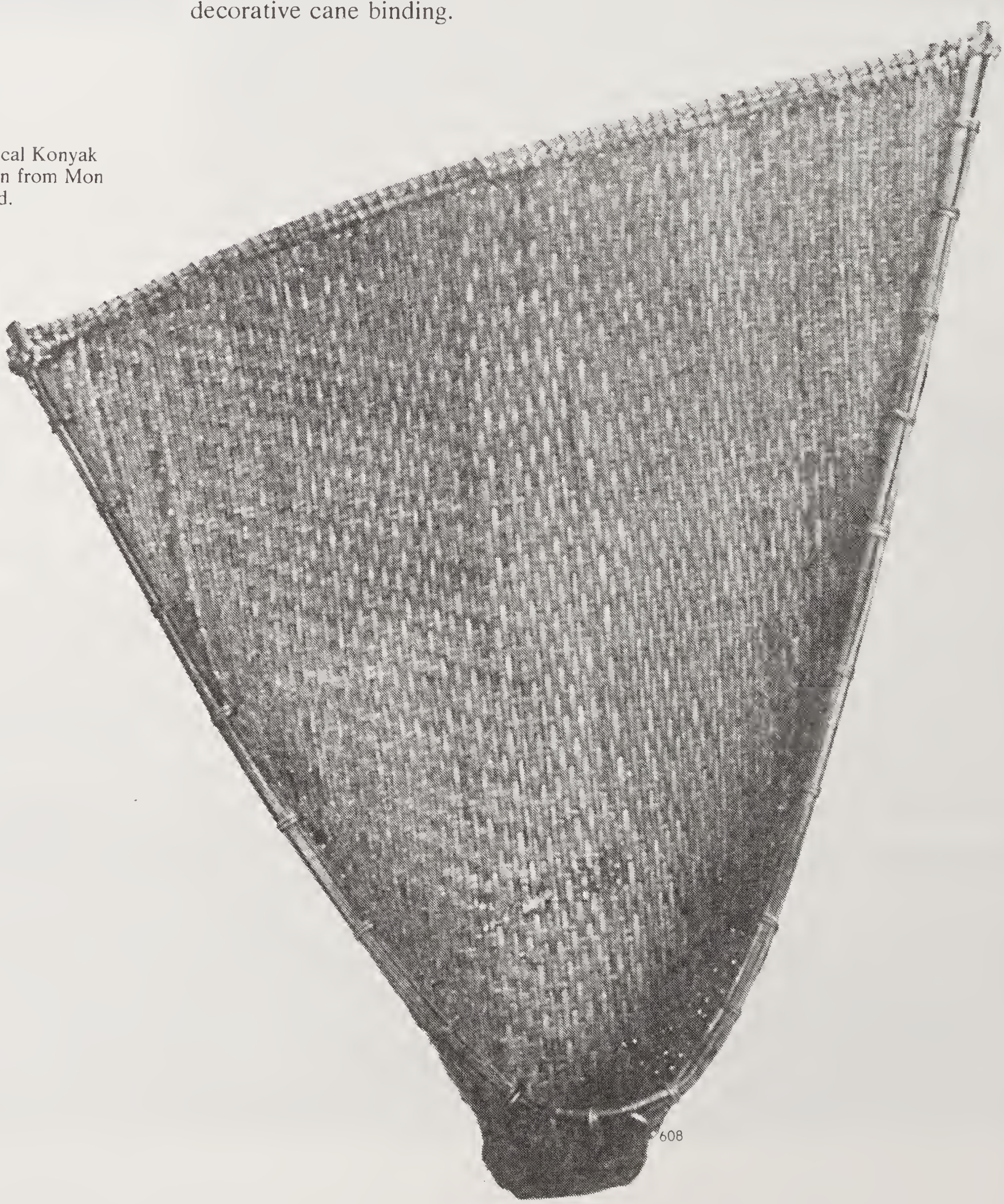
The edges of the mat are sandwiched between one thick splint of bamboo on the outside and a thinner split on the inside. The thin split is folded over the front edge on both sides, ending along the side beside the thick splint. The front edge is sandwiched between a folded split of bamboo beginning and ending underneath the mat. The split is looped over the rim at the corners, holding it in position.

Winnowing Fan from Mon District

A winnowing fan from Mon District in Nagaland is interesting because it is not symmetrical (fig. 608). The rim forms a parabolic arch with one arm longer than the other so that the front edge is not perpendicular to the axis. The longer arm facilitates pouring out the grain from one point.

The mat, made from fine bamboo splits, is cut, folded and stitched so that the back surface is very short, creating a triangular shape. The base of the fold is strengthened on the outside by a crude cane binding. The rim is strengthened with cane strips. The front edge is strengthened by a strip that is folded over the corners so that the ends overlap underneath the mat. This is tied to an additional strip of bamboo that lies just beyond the edge with a decorative cane binding.

608: An asymmetrical Konyak Naga winnowing fan from Mon District in Nagaland.



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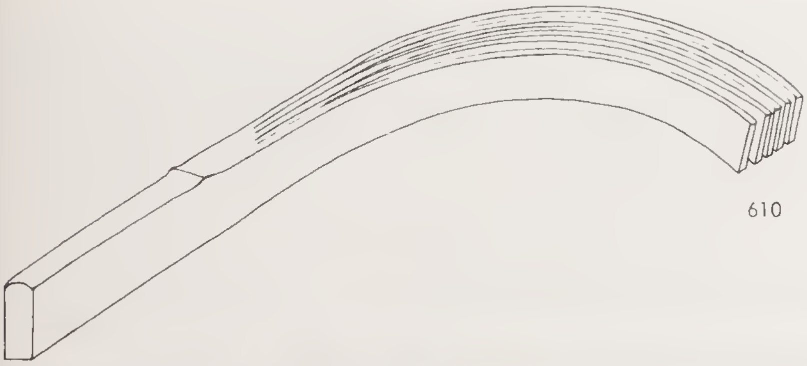
Winnowing Fan from Nalbari

A winnowing fan made in Nalbari, Assam, is a replica of a sample brought from one of the Southeast Asian countries (fig. 609). The wide flat spaced-out warp strips are turned upwards at the back to create the depth. The weft, a continuous strip made from narrow outer splits of bamboo, is woven back and forth across the width. This strip is twisted and folded over a bamboo split around the rim. The back surface of the fan is created by the weft moving in concentric semi-circles.

Two splints of bamboo sandwich the rim of the mat. A third narrow splint lies between them on the top edge of the fan. This splint is partially split into a number of strips so that the bend of the rim is accommodated, with the outer skin of the splint always facing upwards (fig. 610). Two smaller splits of bamboo are tied on either side of the mat just below the rim to provide further strengthening. The front edge of the fan is finished by twisting a couple of weft elements around consecutive warp elements to provide a tighter weave. The ends of the warp elements are twisted, folded underneath and inserted into the weave to prevent it from getting loose. There is no other strengthening on the front edge.



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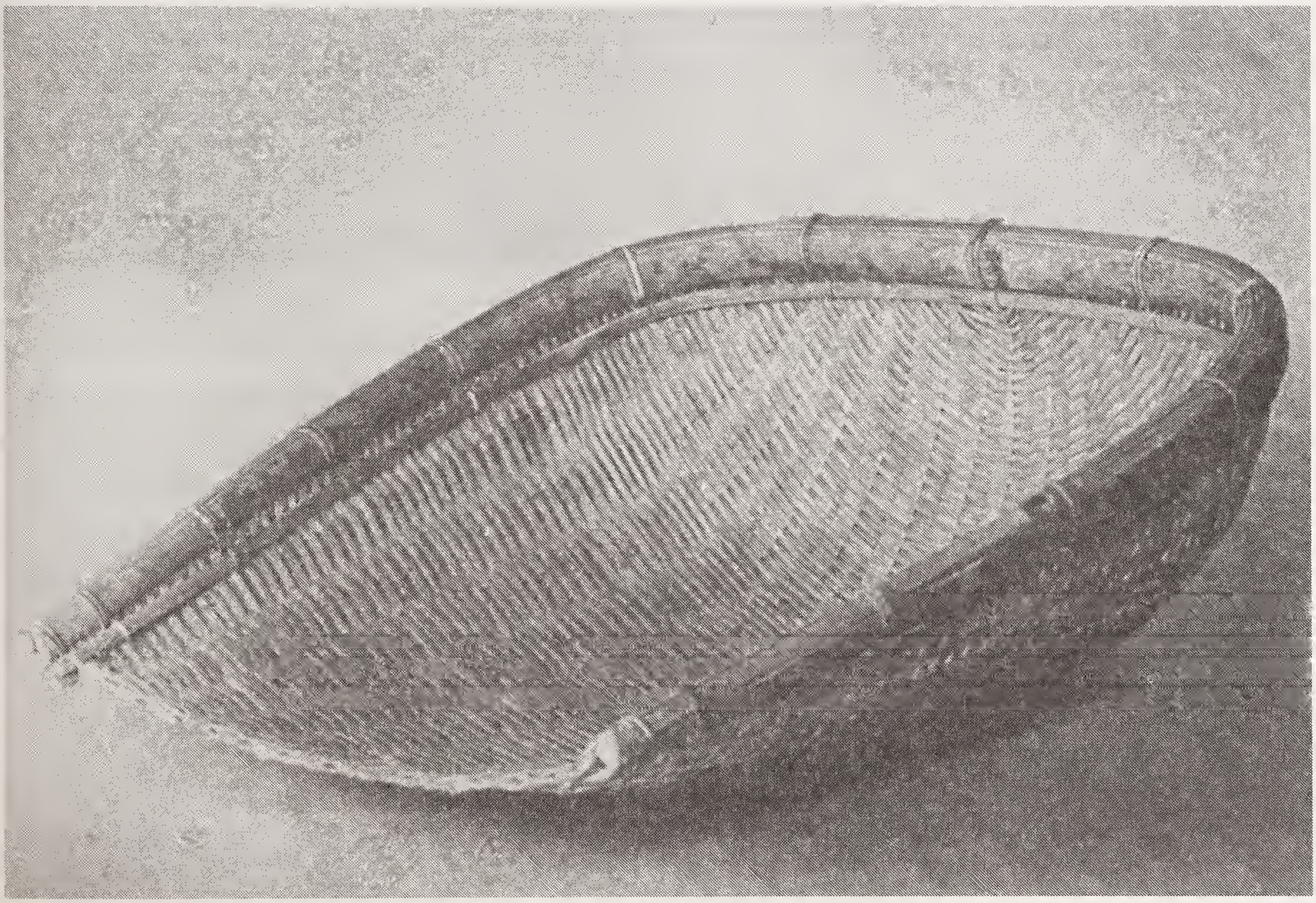
609: A copy of a Southeast Asian winnowing fan made in Assam.

610: The thick splint is broken down into several thinner splits to make it flexible at the bend.



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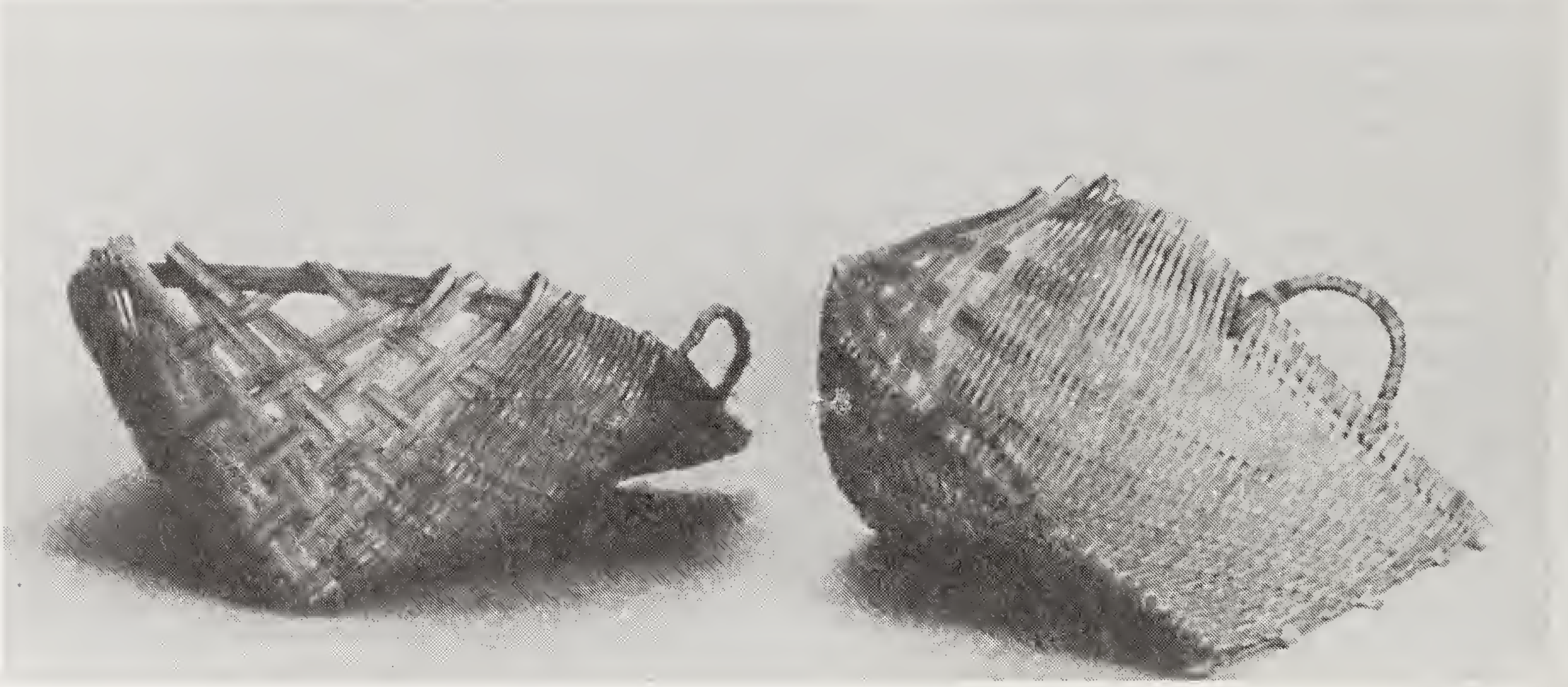

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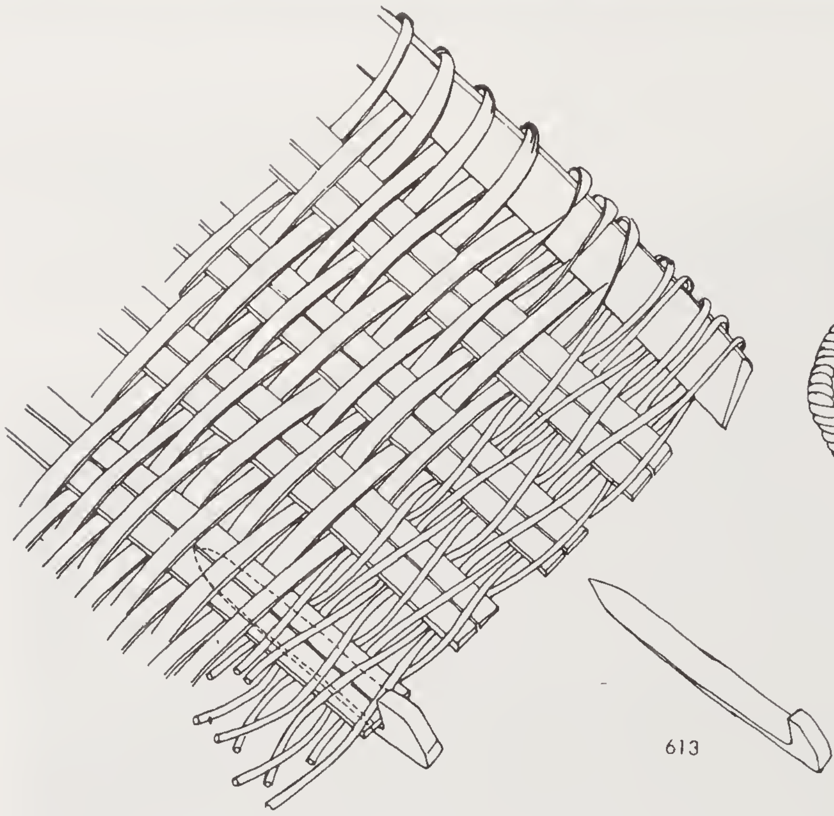

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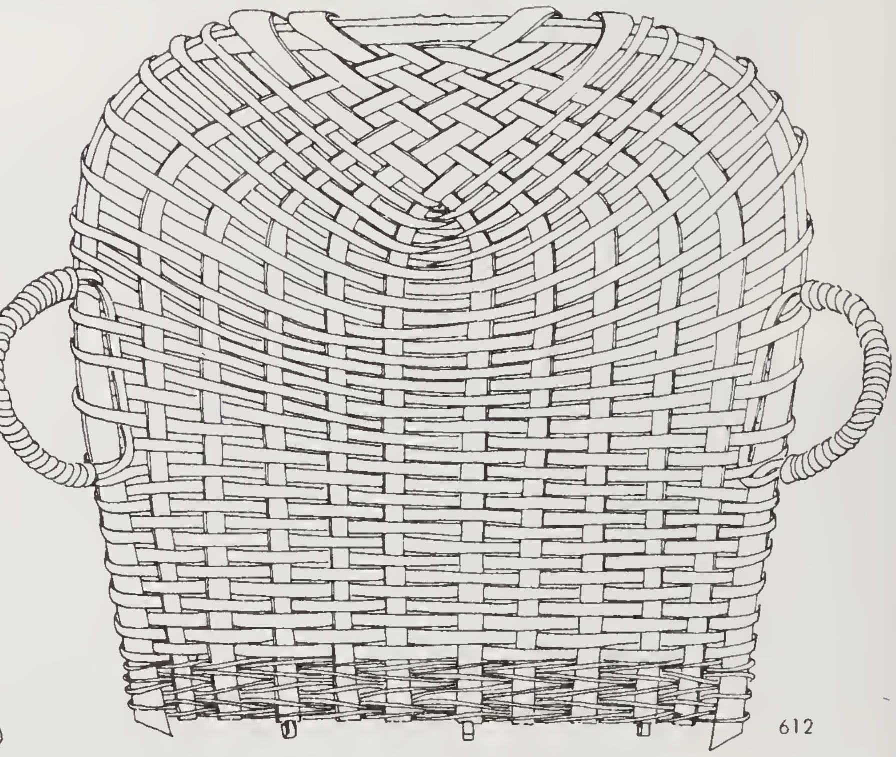

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611: *Kulhas*, the shovels used to shift sand and stones during construction work.

612: The construction of the *kulha*.

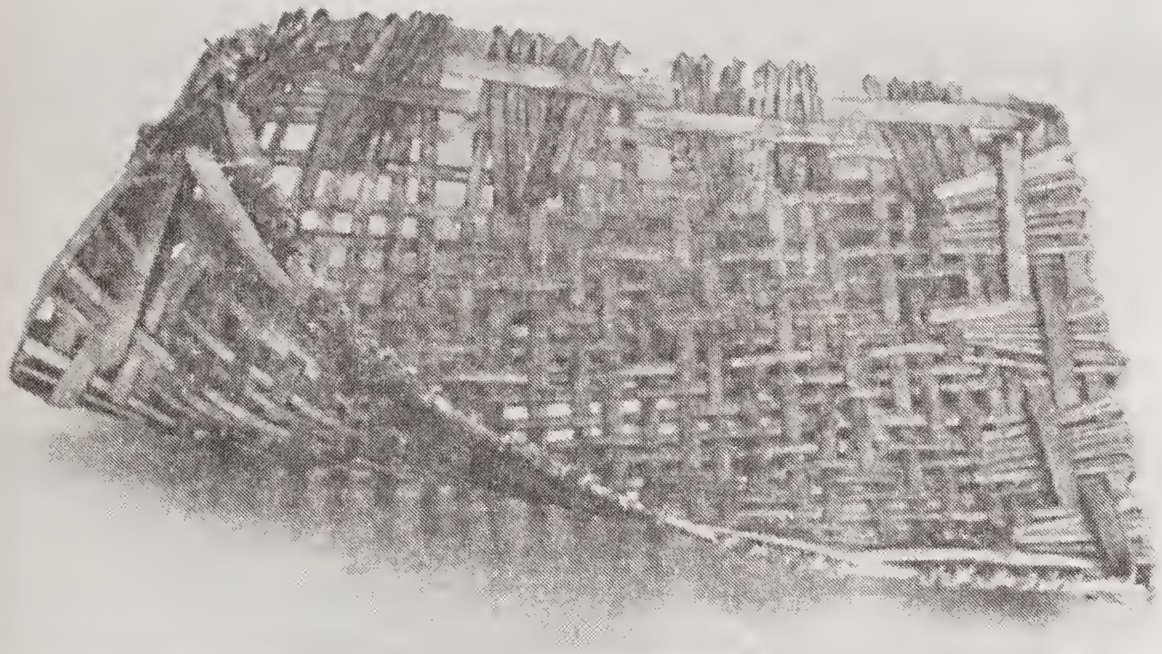
613: The bamboo pins used to hold the weft elements in place.

Kulha

This product seems to be a shovel used to shift mud and stones during construction work. It has the general form of a winnowing fan with the front edge horizontal, and with a triangular back surface creating the depth (fig. 611).

An outer splint of bamboo is bent into an U-shaped rim. Five pairs of bamboo splits, create an inverted triangular back surface and extend straight down towards the front edge forming the warp elements. The back of the rim forms the base of the triangle. Each split is arranged such that the split folded over the centre of the rim moves to form the outermost warp element, and the ones at the ends of the base become the centre warp elements. This creates a sharp corner at the apex of the triangle (fig. 612).

Outer splits of bamboo are used as a continuous weft element and these are woven back and forth from rim to rim interlacing the warp elements. They are bent over the rim and twisted so that the outer skin is always on top. Towards the back surface, the narrow weft element moves at an angle following the sides of the triangle. The angle gradually flattens into a curve,



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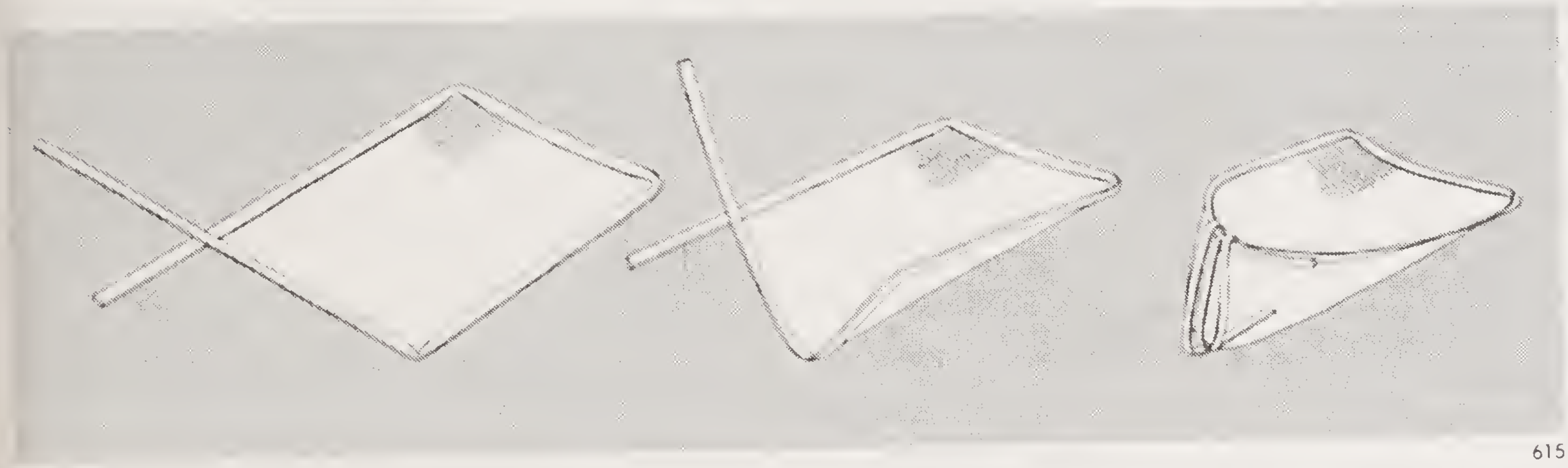


615

614: The mud shovel from Shillong.

615: The method of constructing the mud shovel.

and the width of the weft strip becomes double the original width as it reaches the front edge, where it is almost horizontal. The front edge is finished by a pair of alternatively twisted, thin strips of bamboo interlacing the warp elements. The ends of the warp are cut flush, and three bamboo pins carved out of a node are inserted into the weave underneath the warp elements. The heads of the pins prevent the weft elements from slipping off the cut ends of the warp (fig. 613). A cane strip is looped onto each side of the rim and wrapped around itself to form D-shaped handles. While this shovel is made from coarse splits, without any kind of refinement, it is structurally quite strong and appropriate for its function.

Mud Shovel from Shillong

A very simple, strong construction is used to make a shovel for mud and building materials (fig. 614).

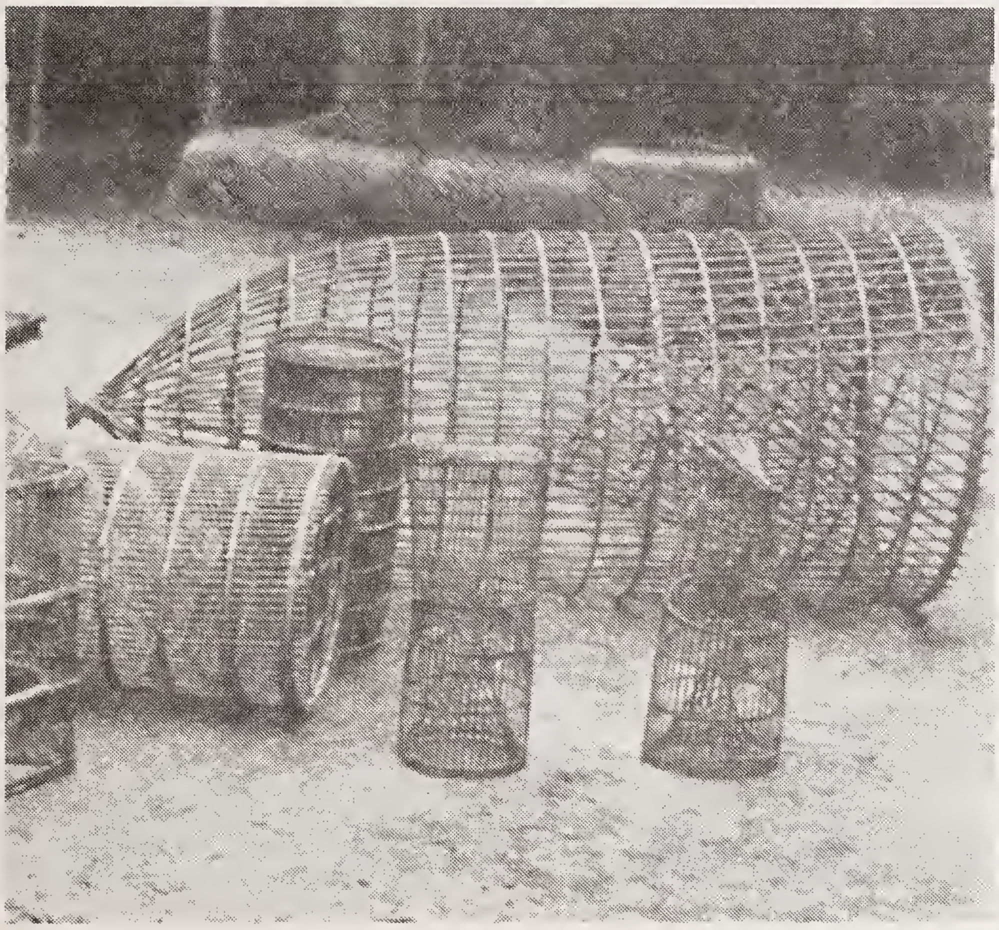
Three outer bamboo splints placed close to each other are bent to form concentric rectangular frames, with the ends extending beyond the frame at one corner. A mat is woven within this frame with outer splits of bamboo in an open-twill weave. The ends of the mat splits, extending beyond the frame in all directions, are twisted and folded over the rim and held between the rim splints.

Once the mat is ready, the shorter edge is folded in half so that the two corners meet (fig. 615). The splints extending from one of these corners are folded into the rim of the other side. The splints extending from the shorter side are bent to lie along the joined edge to end underneath in the weave of the mat. A twisted bamboo rope holds the edges of the joint together at one place. The mud shovel is strong because fairly thick splints are used in the rim and splits cut from the outer layers of bamboo are used in the mat.

Fish Traps and Fish Baskets

Fish Traps

In the plains of Assam, Tripura and Manipur fish is an important part of the people's diet. Fishermen use a variety of fish traps either in flowing water or stagnant pools. The form and structure of fish traps differ, depending on the people who use them and the purpose for which they are used (fig. 616). Apart from the traps, there are baskets used to store the fish. These are carried by the fisher people either in their hands or tied to a belt around their waist.



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618

616: An assortment of bamboo fish traps from Cachar District in Assam.

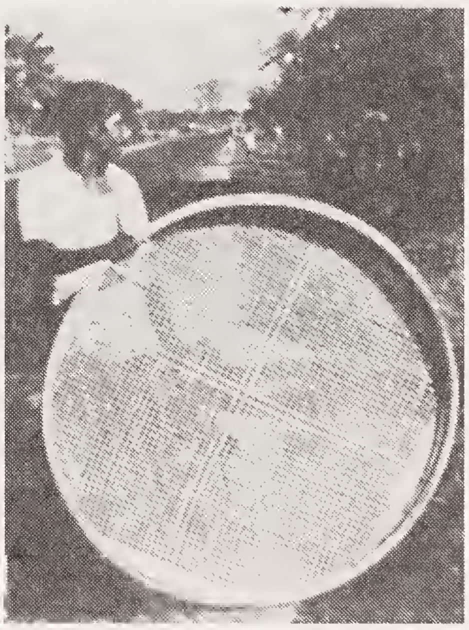
617: The large *chalani* used to catch fish from water hyacinth ponds in Assam.

618: The large *chalani* in use.

Large Fishing Tray from Assam

In Assam a very large "*chalani*" is used to catch the fish hiding between the roots of the water hyacinth which chokes a number of ponds (figs. 617, 618). A circular tray, almost 1,200 mm in diameter, is made from an open-twill-weave mat. The gaps between the strips are almost twice as wide as the strips themselves. The mat is stretched within large circular rings bound together with split-cane binding.

The tray is held horizontally by two people who push it under the water hyacinth rooted in the soft silt of a pond. The tray is lifted up carrying the plants, silt and small fish. It is then shaken to allow the silt to fall through the gaps. The plants are discarded while the fish remain in the tray. These are collected and stored in a basket. The basket has a lid shaped like an inverted cone which is made from bamboo spikes. It is placed in the mouth with the spikes facing inwards, thus ensuring that the fish cannot fall out of the basket.



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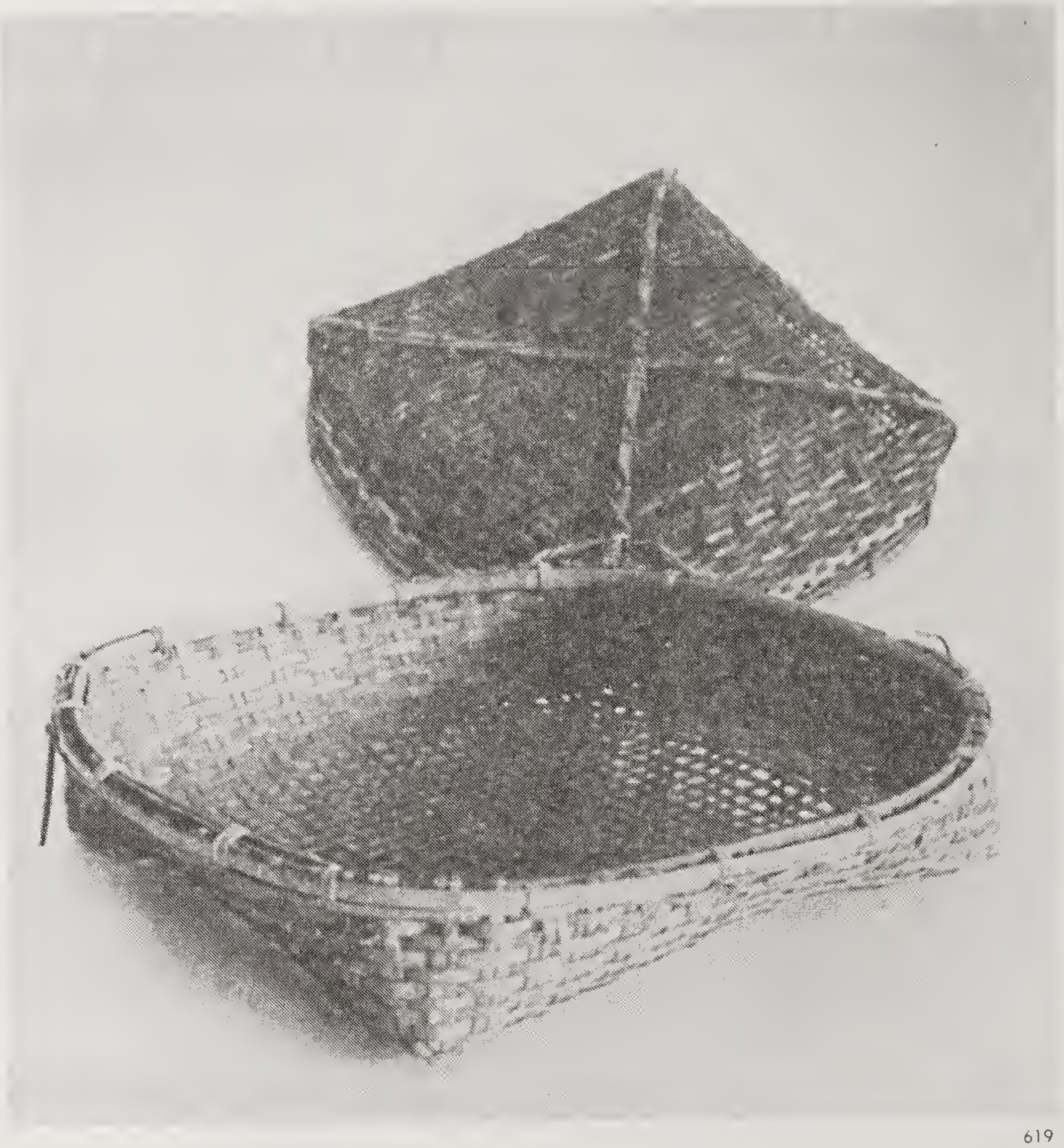


619: *Lithuo*, Ao Naga fishing trays.

619

Lithuo

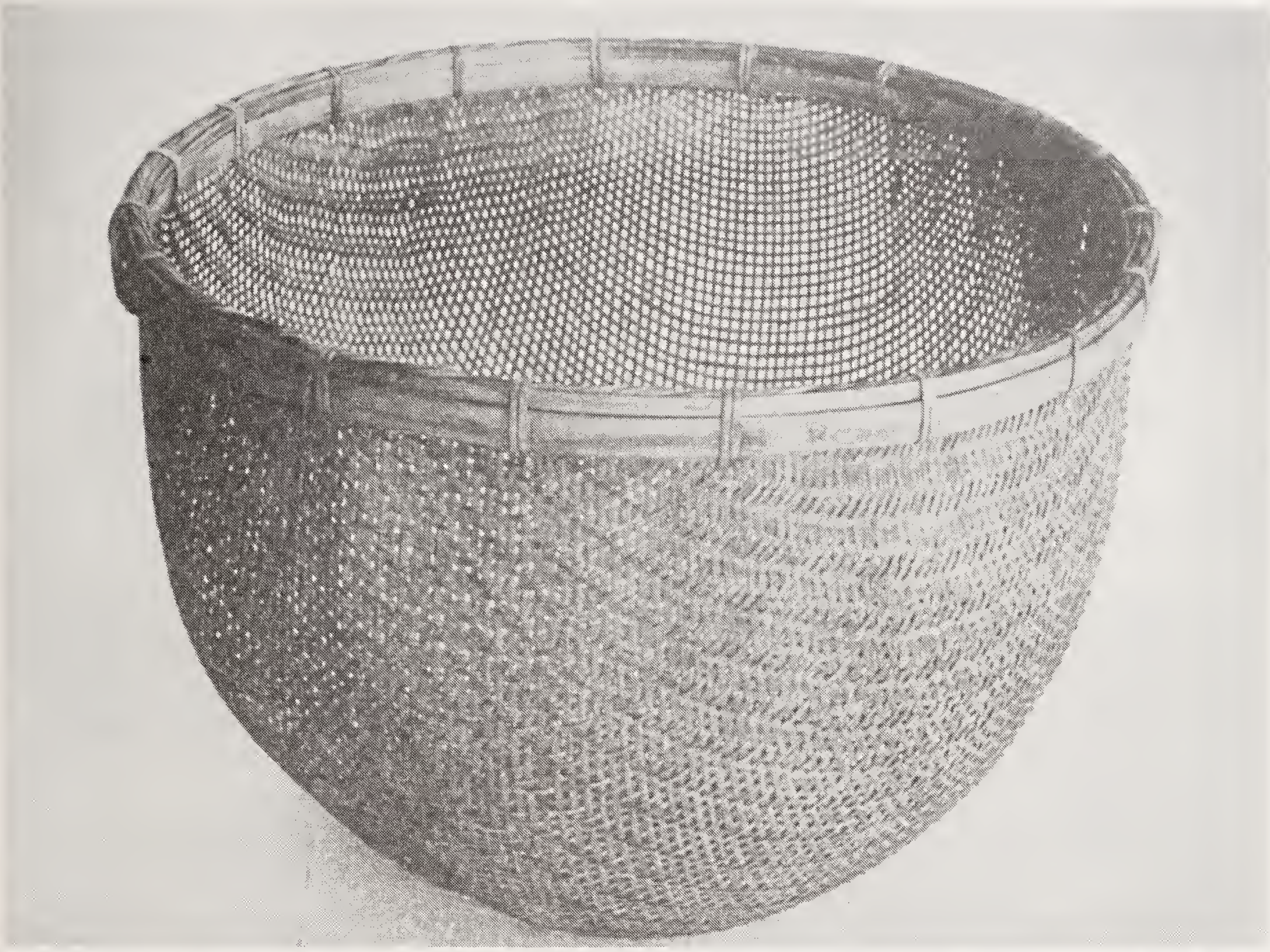
This is a fishing tray used in Nagaland. It is made like a shallow square-based basket with the base woven in an open-twill weave, forming a net-like surface (fig. 619). The base elements are bent upwards where one continuous spiralling strip of bamboo interweaves these ends in a simple basket weave. The rim is strengthened by two half splits of cane sandwiching the edge and is tied with a thin cane split. The body is strengthened by vertical cane splits located at each corner, which overlap the bamboo diagonals under the base.

Long

The *long* is a fishing basket used in Manipur (figs. 620-622). It is used to trap fish by holding its mouth towards the user and against the flow of water. The fish that swim into the basket are scooped upwards, while the water is allowed to flow out through the open net-like structure.

Size and Shape

The *long* is shaped like a deep semi-spherical container where the diameter of the rim is 510 mm while the depth is 390 mm. The ratio between the diameter and depth is much higher than in the *korahi,* hence the method of construction is different, even though the basic principle remains the same. Here a woven mat is moulded to the required shape before being held in shape between stiff bamboo rings.



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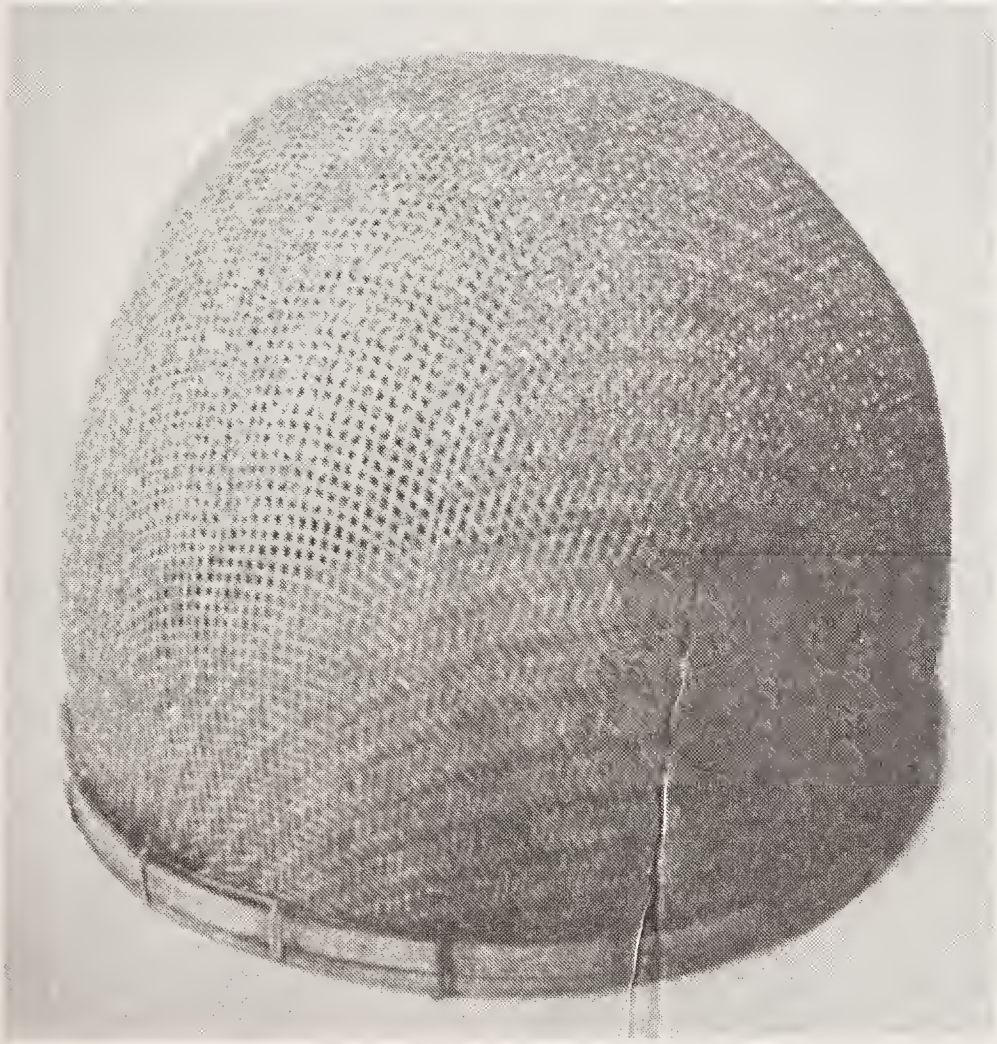

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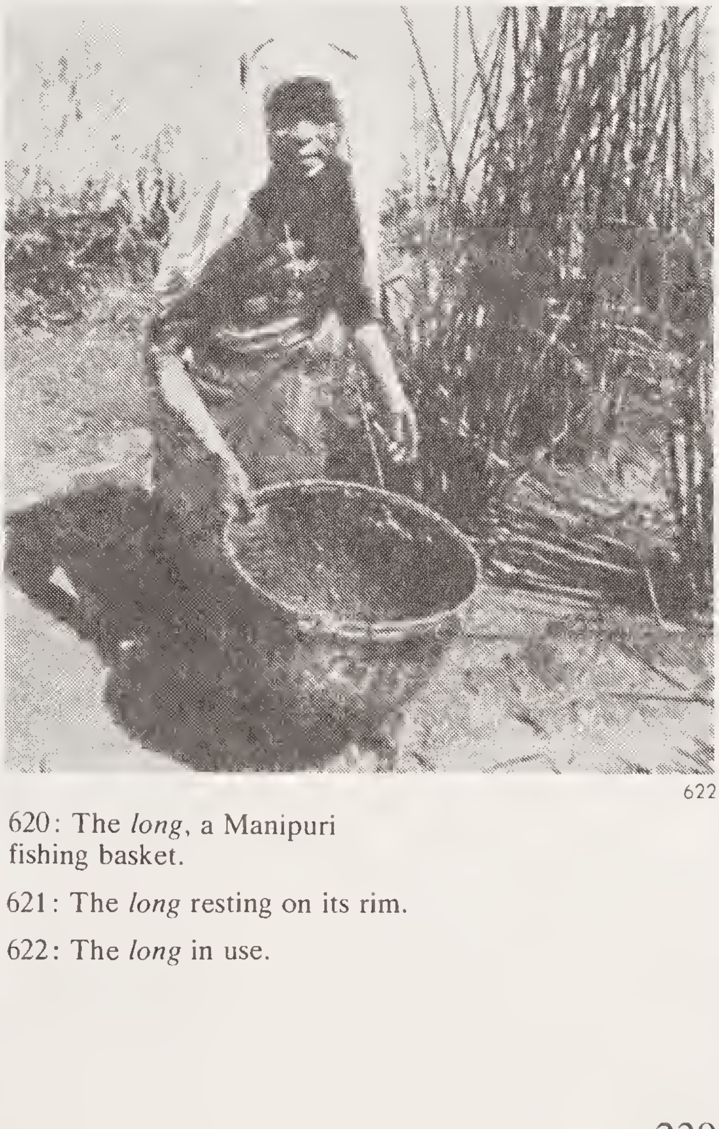

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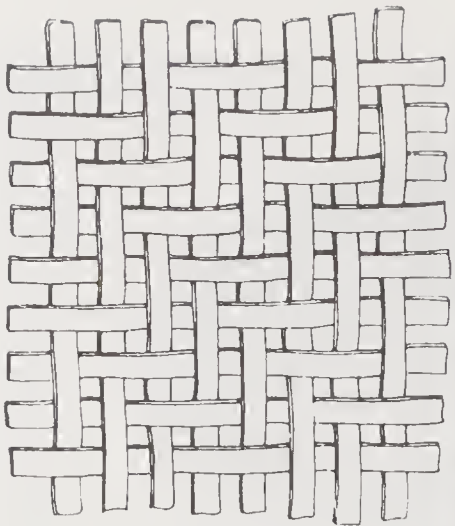
620: The *long*, a Manipuri fishing basket.

621: The *long* resting on its rim.

622: The *long* in use.



624

623: A Manipuri woman weaving the mat for the *long*.

624: The weave structure of the mat.

625: The four corners of the mat are lifted up before the outer ring is pulled up.

626: It is bound at four places before the folds are eased out.

627: The strips are twisted and pushed back between the rings.

628: Detail of the rim finishing and binding.

629: The Manipuri *daos* used to make the *long*.

623

Mat Weaving

A Manipuri woman at Patsoi village near Imphal prepares these baskets on a professional basis for sale in Imphal bazaar. She demonstrated the complete process for preparing such a basket. The mat, prepared from fairly fine splits of bamboo, is woven in an open-twill weave, in an even texture (figs. 623, 624). In the open structure of the weave, the width of the gaps equals that of the bamboo strips used in the weave.

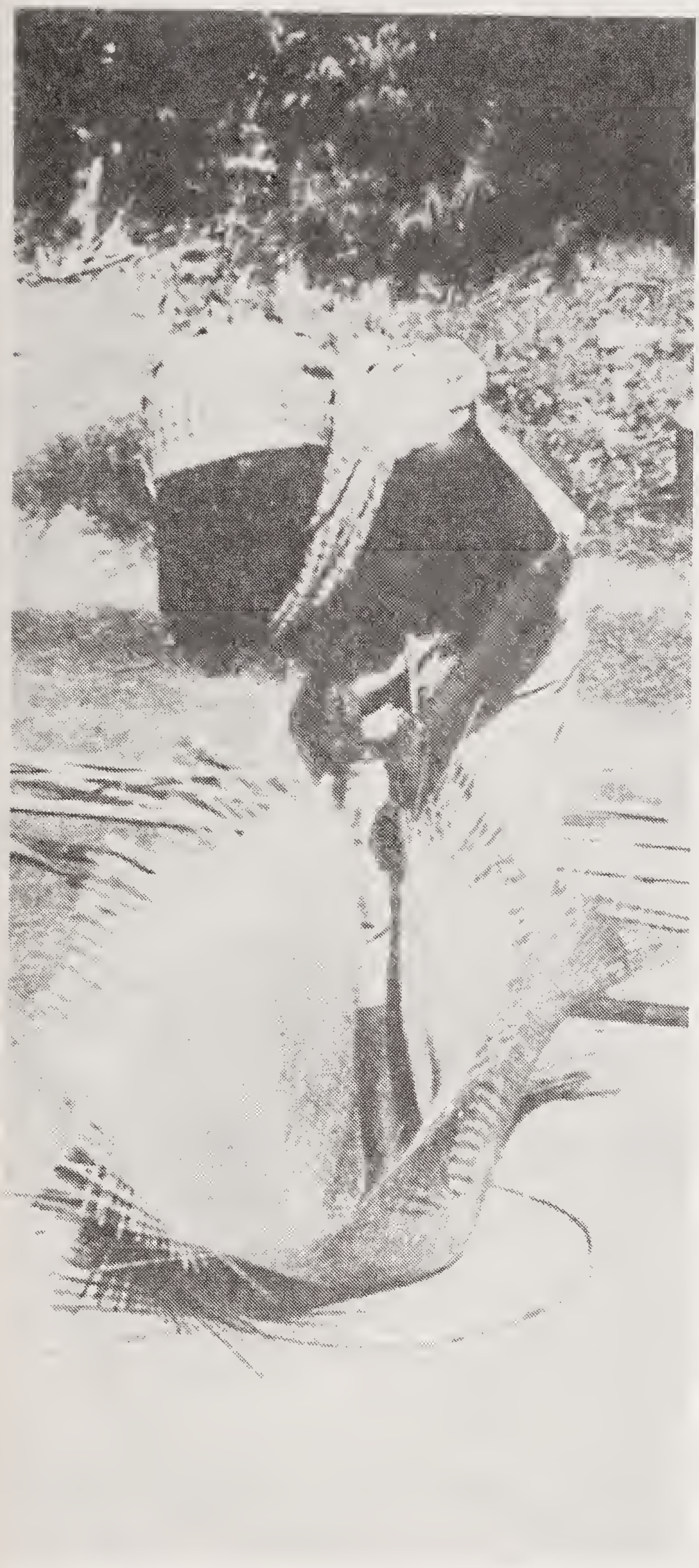
Mat Moulding

Two concentric rings made of stiff bamboo splints are prepared. These determine the diameter of the basket, as they are used as the rim-strengthening elements. All the components required for the basket are prepared and stored. Before assembling the basket, the mat is soaked in water for a short while in order to make it pliable. The stiff outer ring is placed on the ground and the mat is placed over this ring. The woman stands on the centre of the mat and the four corners of the mat are lifted off the ground to be held between her knees (fig. 625). The bamboo ring is then pulled up to hold the mat, cupped within the ring, when it is released from the knees. It is bound temporarily to the ring at four places before the folds and creases are eased out by realigning the elements of the mat weave. This is done by using both hands and feet, with the woman sitting on the ground, and the basket takes on a smooth curvature (fig. 626).

Rim

The inner ring is placed inside the rim of the basket and held in place by temporary binding. The edge of the mat, extending above the rings, is trimmed, leaving a sufficient length for finishing. The strips that protrude above the rings are twisted and pushed back between the rings, after which the edge is bound firmly by split-cane binding (figs. 627, 628).

The only tools used in the process are a few flat bladed knives (*dao*) of different sizes. All the splitting and shaping operations involved are accomplished with these. These knives are locally known as *sangai* (small blade) and *thangjou* (wide blade) (fig. 629).



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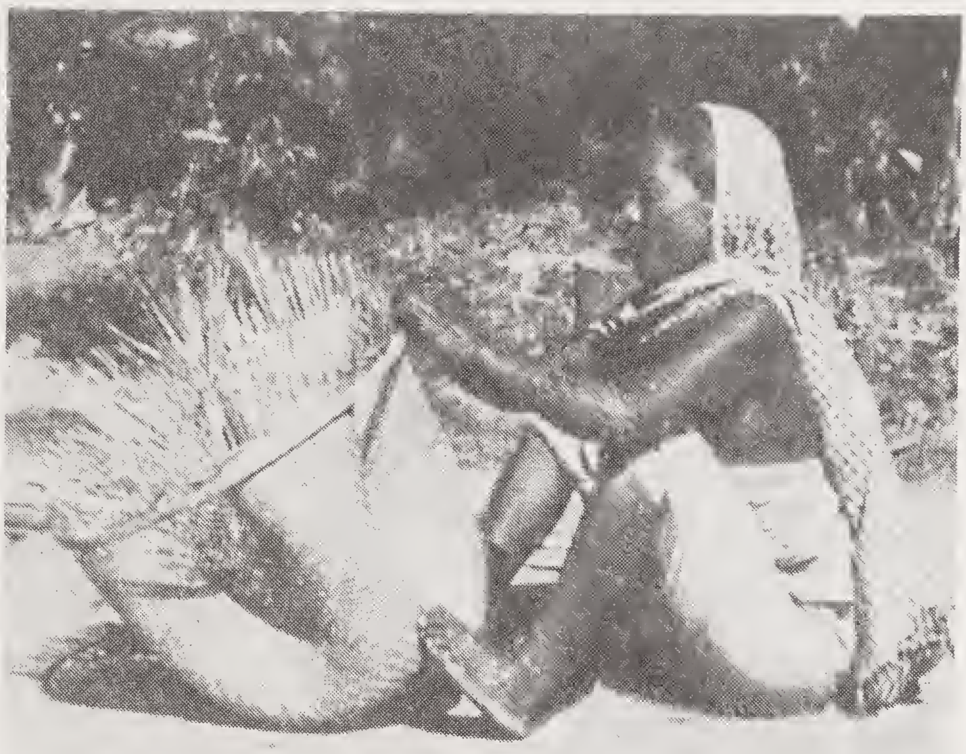

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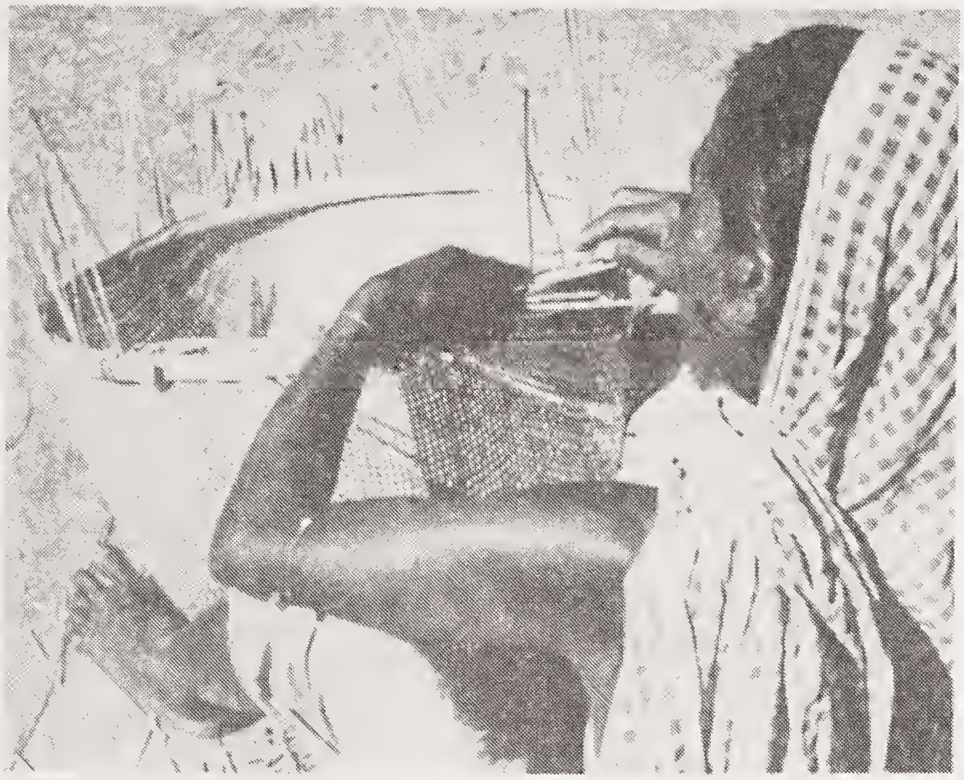

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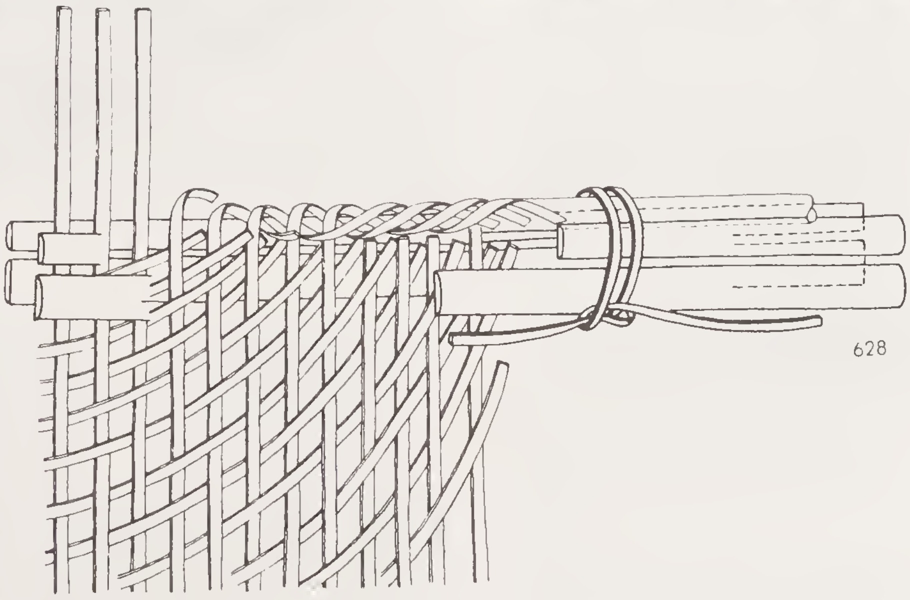

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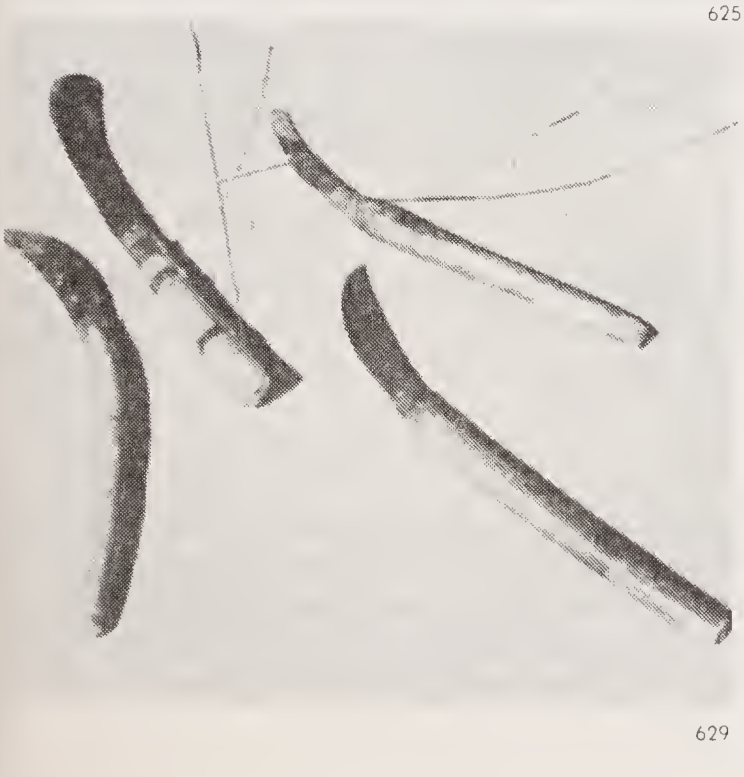


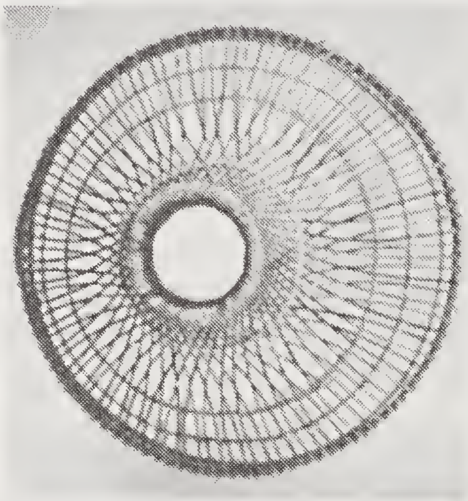
629

Pollo from Tripura and Assam

This is a fish trap used in the plains of Assam and Tripura. It is used in still, shallow waters in fields and ponds. Basically a conical form, it has a broad base and a narrow mouth, and is open at both ends. The fisherman walks in fields and ponds with the fish trap in one hand. When he sees a fish, he puts the trap over it, removes the fish from the cage through the mouth, and stores it in the basket tied to his waist. Similar fish traps called *longup* are used in Manipur.

630: The *pollo*, a shallow water fish trap from Tripura.

631: The *pollo* as seen from above.



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632: The cane binding just below the neck of the *pollo*.

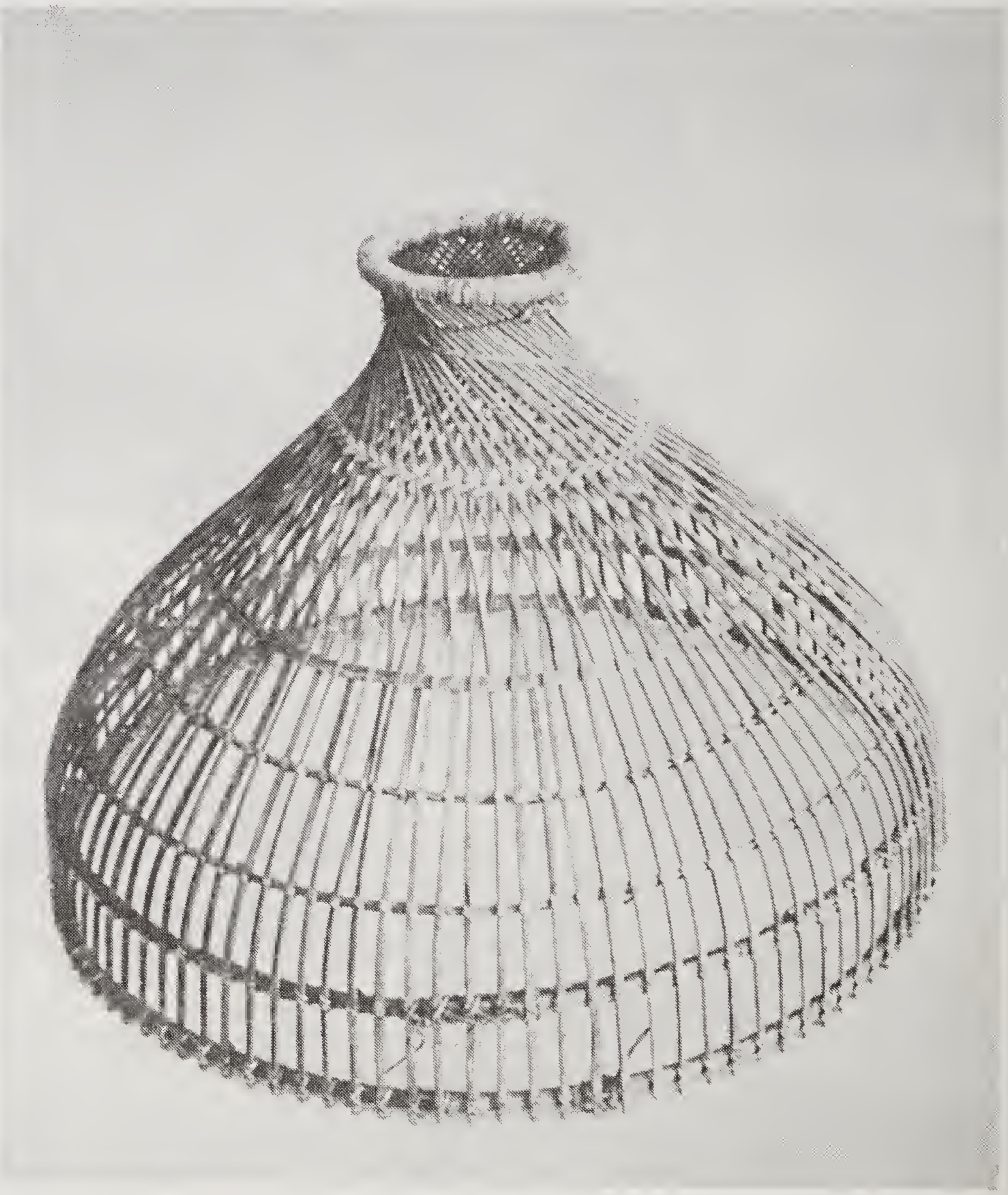
633: The movement of the cane strip in the binding.

634: The binding at the centre.

635: The movement of the cane strip in this binding.

636: The binding at the base.

637: The movement of the cane strip in this binding.



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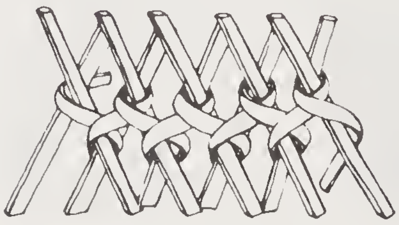

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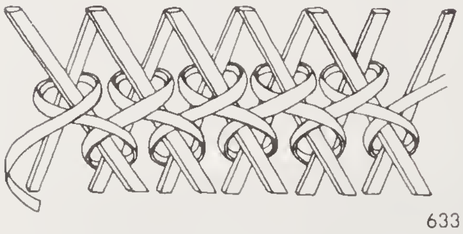

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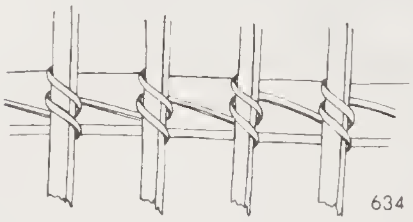

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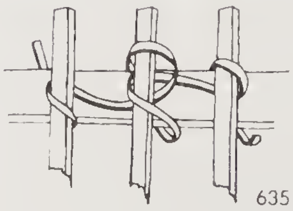

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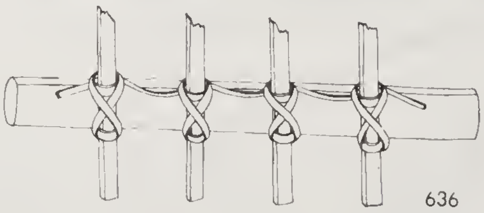

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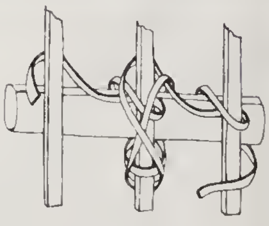

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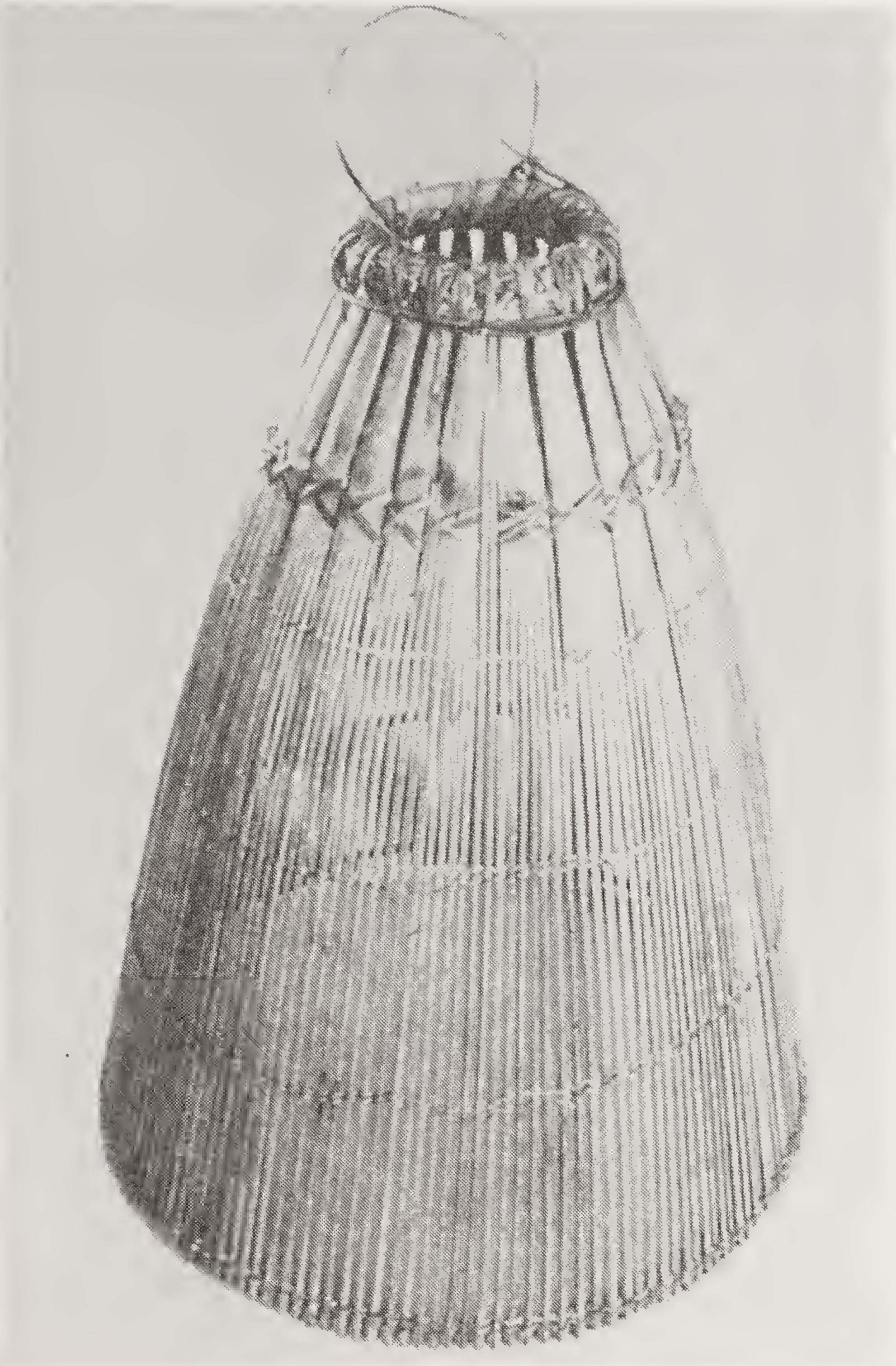
Pollo from Tripura

The *pollo* from Tripura has an extremely strong structure (figs. 630, 631). Two layers of bamboo splits, about 6 mm by 4 mm cross-section, are tightly bound between two rings at the mouth. The two layers move in opposite directions, forming a hyperbolic paraboloid at the neck. As they begin to fan outwards, the layers are held together by a cane binding below the neck



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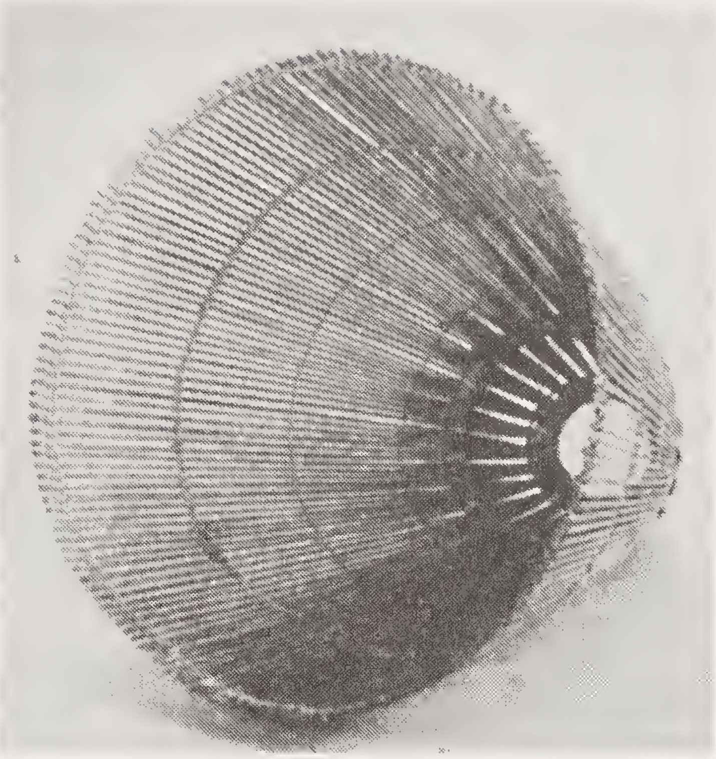

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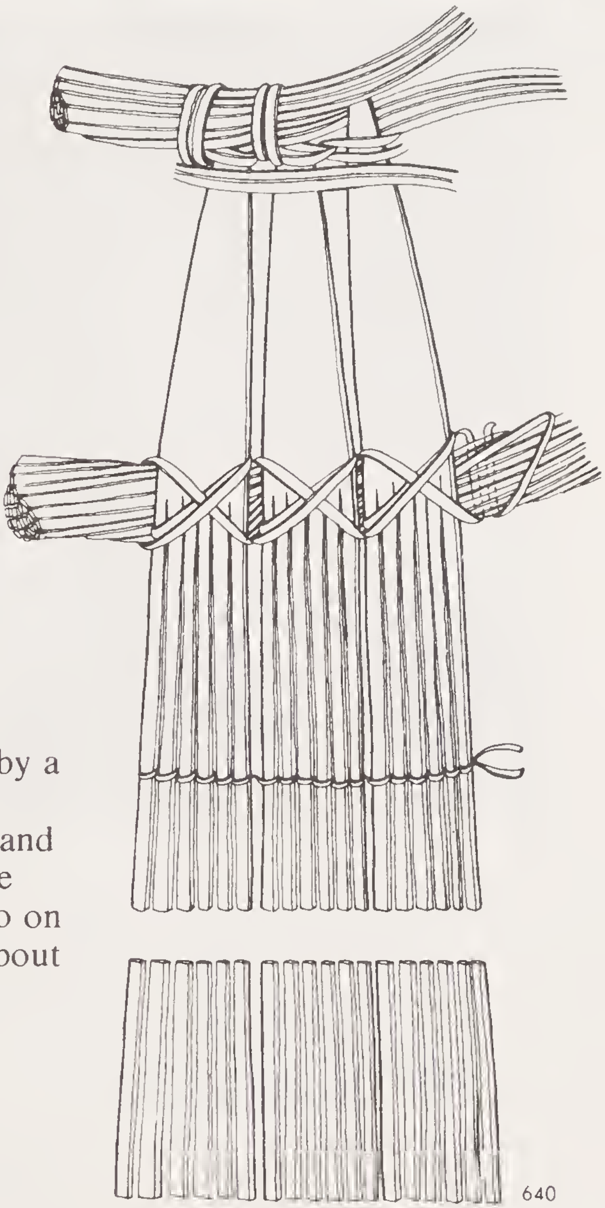

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(figs. 632, 633). Further down, the strips are brought into the same plane by a horizontal ring made by weaving a strip of bamboo between the staves so that the back layer is in front of the ring. The strips fan out a little more and then move more or less parallel vertically down to the base. The strips are held in place by cane binding that ties them to horizontal rings of bamboo on the inside of the *pollo* (figs. 634-637). There are four such rings, spaced about 60 mm apart. The horizontal rings are thicker than the staves and help to strengthen the whole structure.

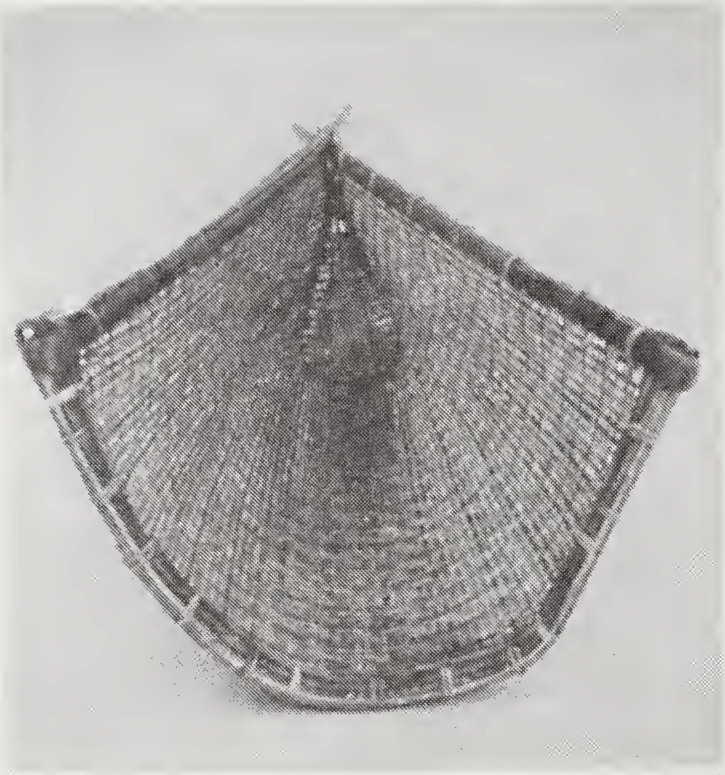
Pollo from Assam

The *pollo* from Assam has a much simpler structure (figs. 638, 639). A number of staves of bamboo, about an inch wide, are tapered just above a nodal point. The narrow tips are held between rings of bamboo lashed together to form the mouth of the *pollo* about 75 mm above the nodal point (fig. 640). At the nodal point the staves are tied to a thick ring of locally twisted strips of bamboo. This ring is on the inside, and serves to strengthen and hold the staves in position. Just below the node the staves are split into six to seven strips which fan out slightly to a broader base and horizontal rings of cane binding between the node and the base hold the strips together. There is no additional strengthening ring, and the base is, therefore, fairly flexible and can be easily deformed.

638: The *pollo* from Assam.

639: A view of the *pollo* from below.

640: The construction of the top of the *pollo* and the cane binding that holds the strips in place.



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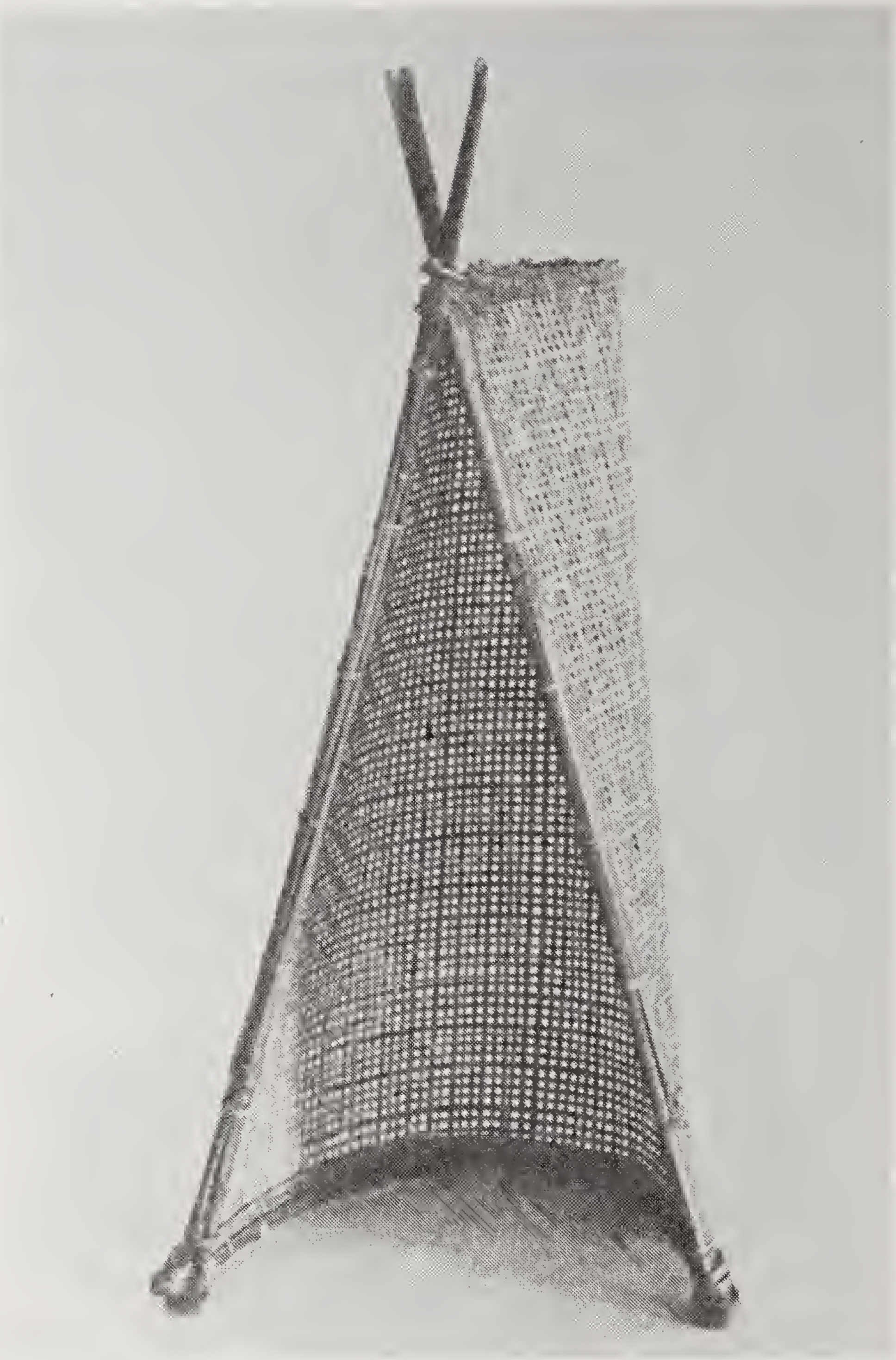


641

641: The *sudha*, a Jamatia fish trap.

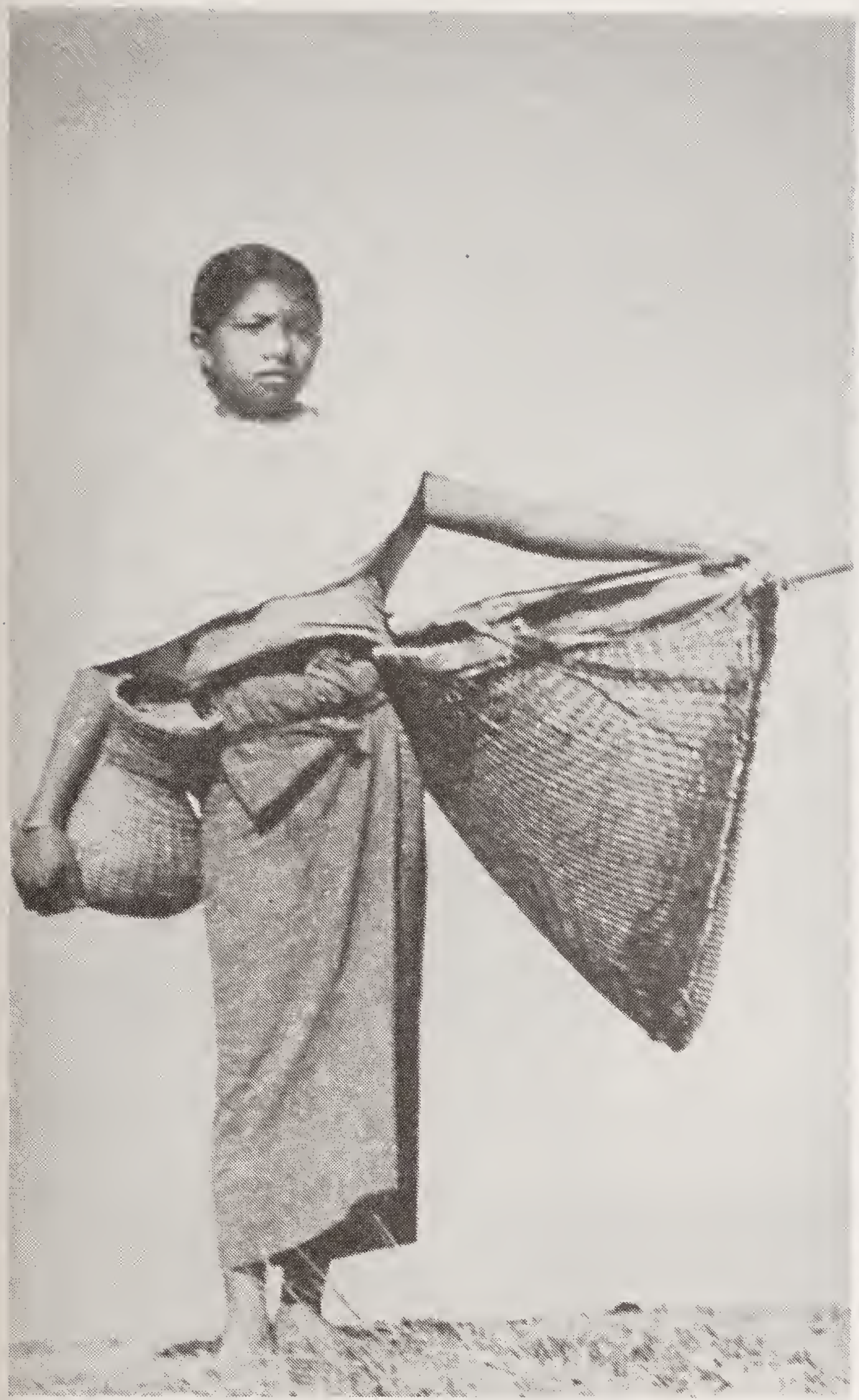
642: The *sudha* lying on its side.

Sudha

This is a fish trap used by the Jamatia tribe of Tripura (figs. 641, 642). It is basically a net suspended from crossed splints, and is held in both hands so that the front of the net is inclined towards the body, and against the flow of water. Fish that swim into the net are scooped up out of the water and stored in the basket.

Structure and Construction

The net is a rectangular bamboo mat woven in an open-twill weave. The longer edges of the mat are held between two pairs of splints and these extend beyond the mat on one side. The splints are crossed at an angle of about 30° and the short arms of the cross form the handles. At the point of intersection of the splints, the back corners of the mat meet, forming a closed loop. This is blocked by a separate woven surface, over a frame of bamboo split bent to the required shape. This surface is tied to the mat with wire and the contour is strengthened with a bamboo split which also folds over the intersection of the handles, thus creating a fairly rigid structure. The front edge of the mat lies as a semi-circle between the long ends of the cross. This edge is strengthened with a continuous cane split that begins and ends under the mat, folding to pass over the ends of the splints at the corners.



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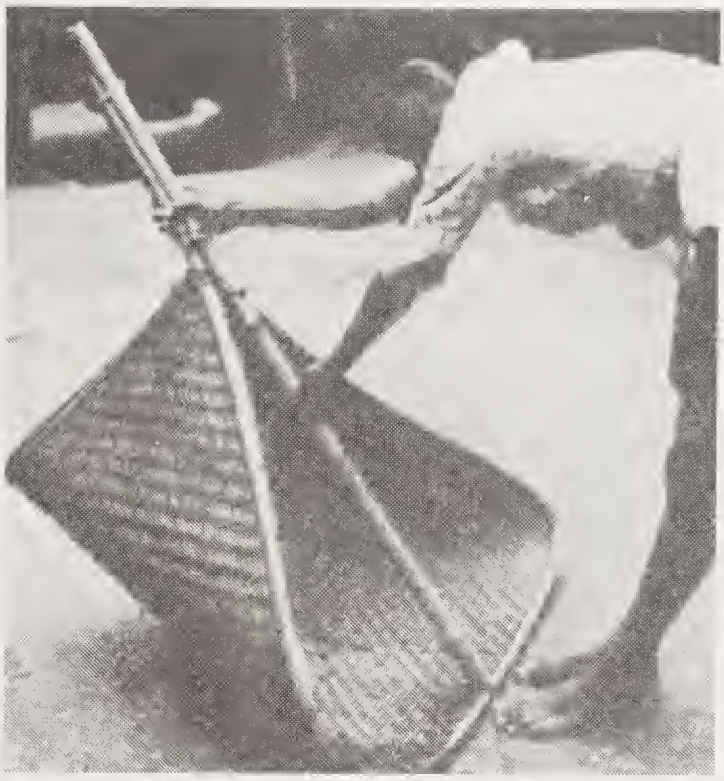

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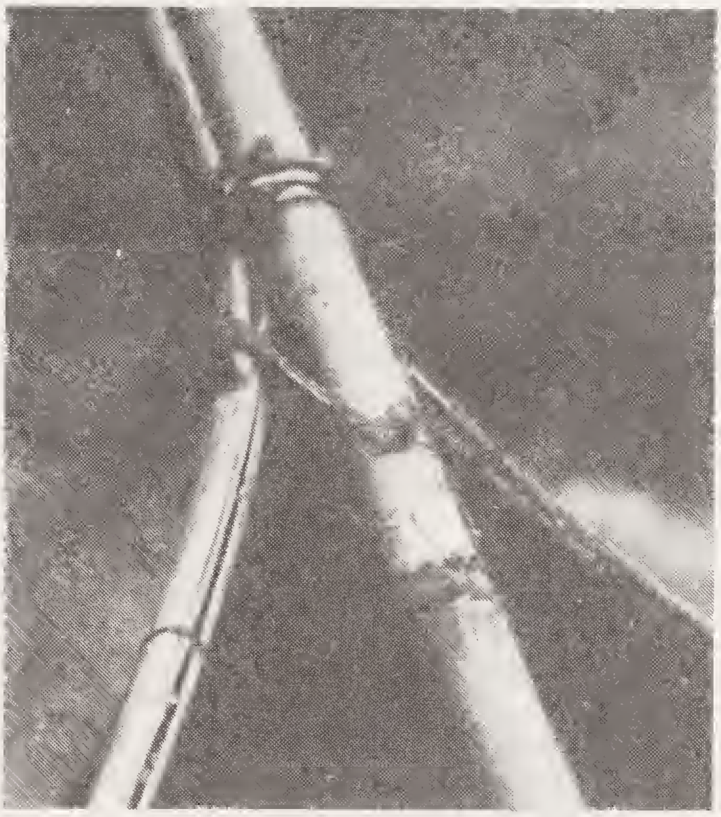

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643: An Assamese girl carrying a *jhakoi*, a shallow water fish trap.

644: A Tripura Bengali boy demonstrating the use of their version of the *jhakoi*.

645: A dowel in the handle holds the binding in place.

Jhakoi

This is a fish trap used in Assam which is very similar in construction to the *sudha* (fig. 643). The *jhakoi* is also made from a rectangular mat, but the difference lies in the front edge which is straight, forming the base of an equilateral triangle. A continuous bamboo splint is used to strengthen the periphery of the triangle, formed by three edges of the mat. The ends of the splint extend upwards from the apex of the triangle, forming the handle. The loop formed by the fourth edge is blocked by a woven surface, as in the *sudha.*

Another fish trap seen in Nalchar, Tripura, was similar to the *jhakoi* (figs. 644, 645). It had an additional strengthening element of a small diameter bamboo culm which ties the handle to the centre of the base, dividing the triangular opening in half. Apart from the binding at the handle, this bamboo is held in place at the front edge, by hooking twisted bamboo loops from the front edge onto two sides of a bamboo pin, that is pierced horizontally through the bamboo. A similar pin and loop holds the bamboo tie to the apex of the triangle.

Shallow Water Fish Trap from Assam

This fish trap from Cachar District is fabricated from a number of pieces of mat (fig. 646). The mats are made by arranging a number of parallel strips of bamboo, which are held together by rows of cane binding widely spaced apart. The binding is effected by twisting a pair of cane splits such that each twist holds consecutive strips of bamboo. The mat thus formed is flexible in the direction of the binding. The base is a rectangular mat of thick slats of bamboo oriented across the width. One of the shorter sides is rounded to form a horizontal arch. The fine mat forms a wall around the perimeter of the base and the side opposite the arch-shaped end is shaped like a wedge, with a narrow gap at the tip of the wedge. The corner of the wedge points towards the top of the arch.

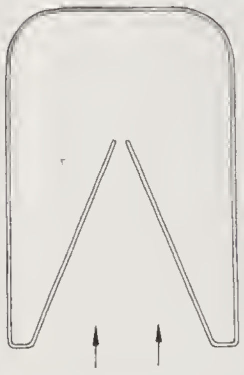
The base of the wedge is placed facing the flow of water. The fish are guided by the wedge towards a small gap and are trapped in the enclosure between the wedge and the arch (fig. 647). As the fish trap is open at the top it can only be used where the level of water is below the top edge.

All the joints are reinforced by bamboo splits. The walls are stiffened and held in the required shape by sandwiching the mat at various levels between two thick bamboo splits. This structure is very delicate and the shape can easily be deformed. The same concept is used for large fish traps fabricated to stand inside flowing rivers and streams.

646: A shallow water fish trap from Assam.

647: A schematic plan view showing the working principle of the fish trap.

648: A passive shallow water fish trap made from a whole culm of bamboo.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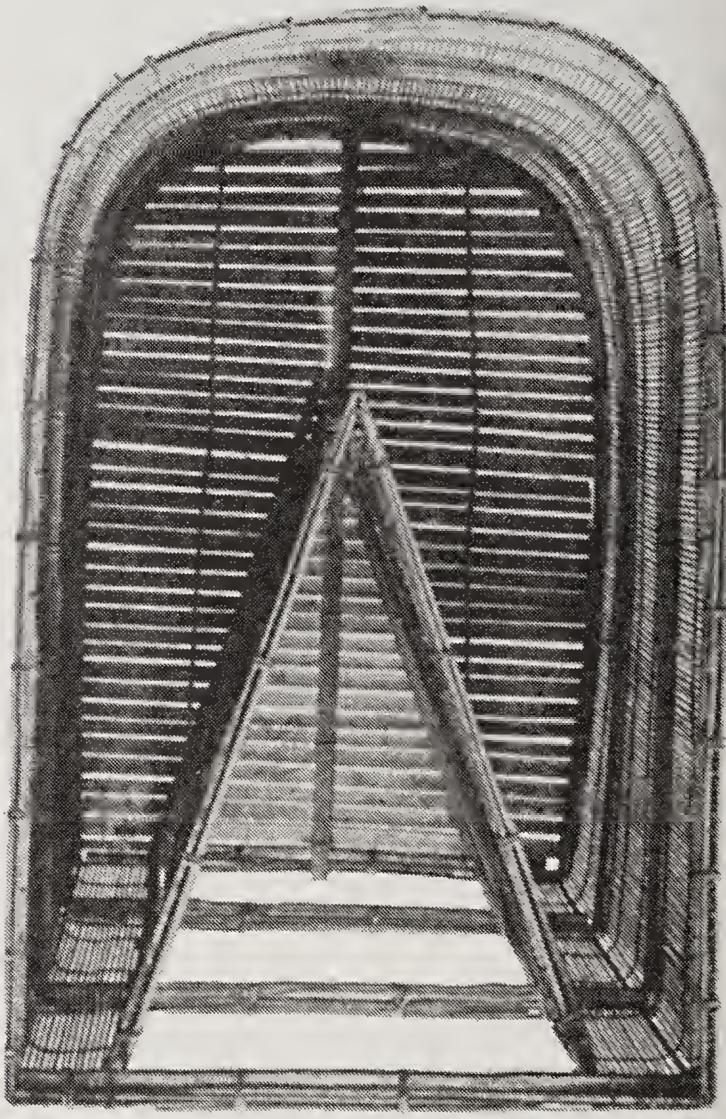
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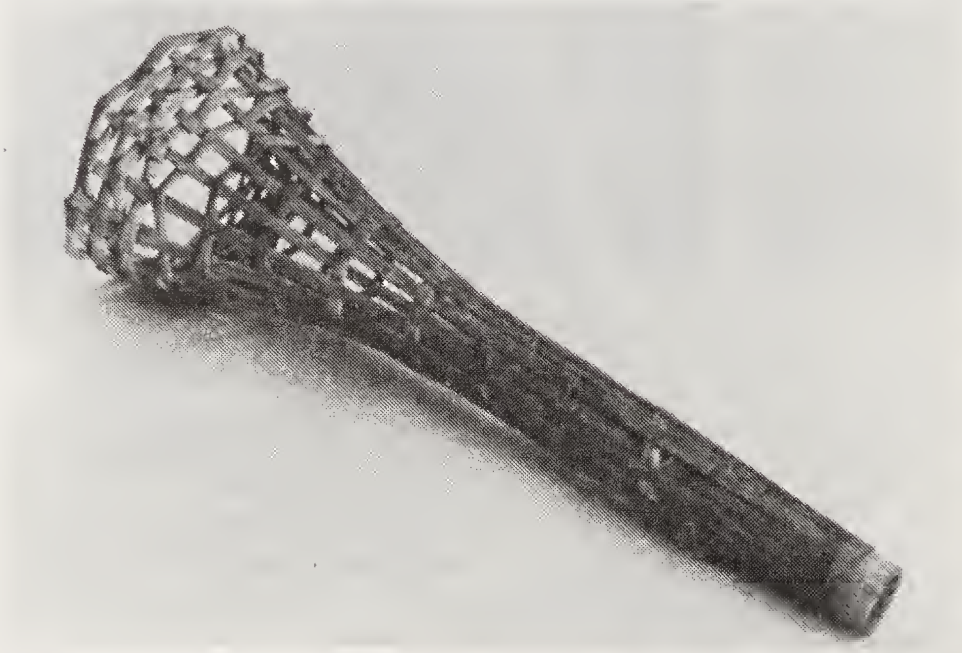
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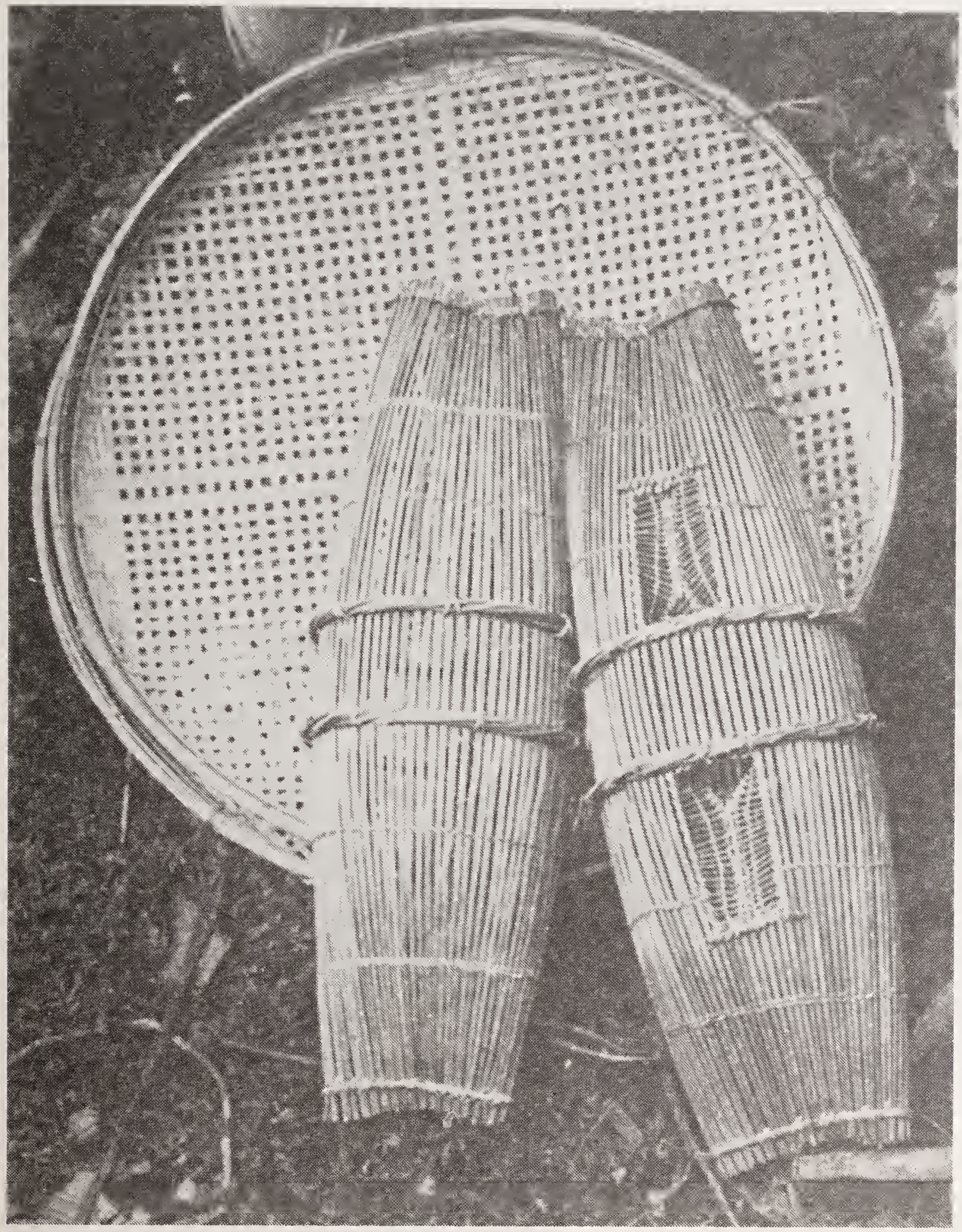
Conical Fish Trap from Assam

Whole bamboo culms are modified and used to make fish traps in Assam (fig. 648). A piece of culm ending in a node is split radially upto that node. The splits are spread outwards and a spiralling strip of bamboo is woven between these splits, holding them in position. This creates a long funnel, ending with the node at the apex. The fish trap is placed facing the flow of water in a shallow stream. Small fish are swept into the funnel to be trapped at the node.



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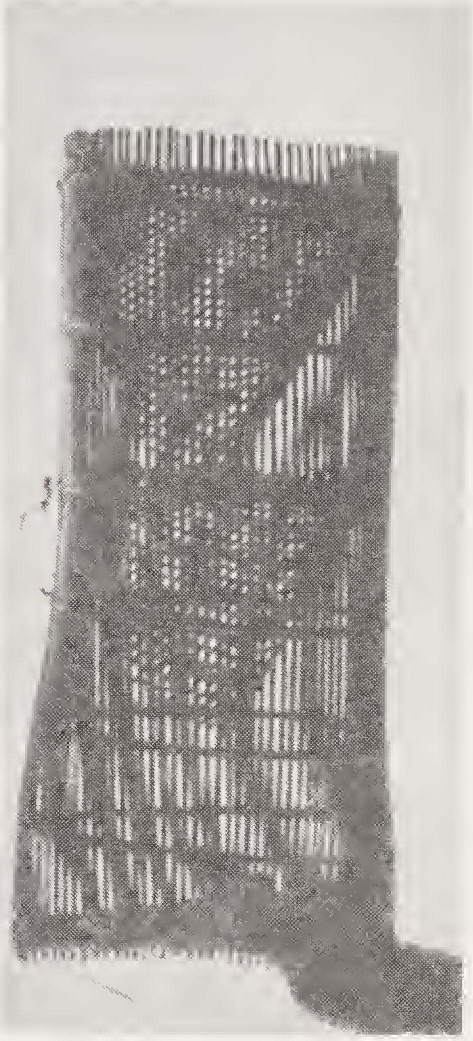

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649: A couple of fish traps and fishing trays for sale at Bangla bazaar.

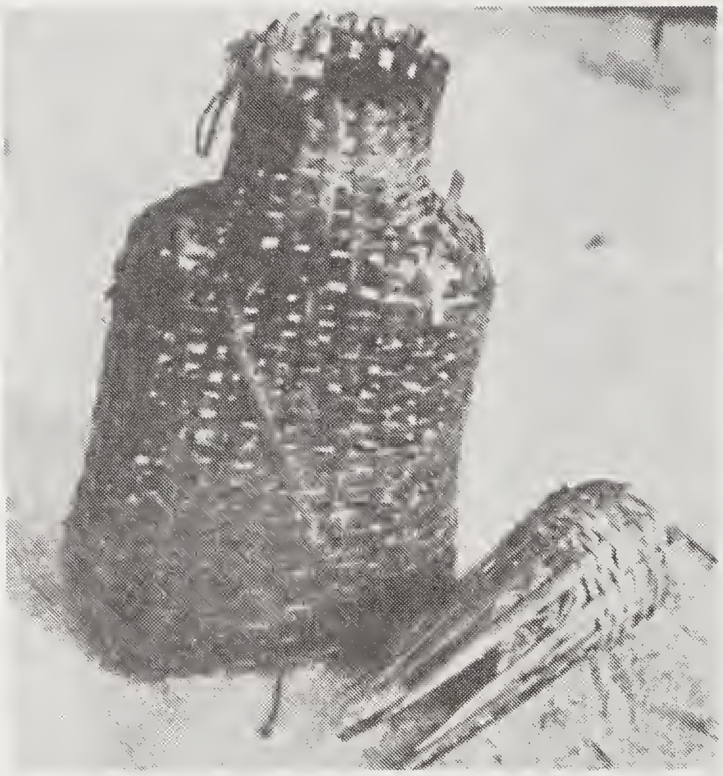
650: A fish trap from Koraibari with two spiked cones.

Conical Fish Trap from Manipur

A similar construction principle is applied on a much larger scale for a fish trap seen in a Manipuri village in Cachar District. A bamboo whole culm is split at one end and these splits are spread outwards and held in place by tying them to a series of bamboo rings, at intervals along the length. This creates the funnel with the node at the apex and this trap is called *huppi*. To obtain a larger diameter at the mouth, another conical cage-like structure is made from bamboo splits. This structure is open at both ends. One end fits into the mouth of the *huppi* creating an extension to it. The combination of the *huppi* and the open-ended structure is called *saralu*. The fish enter through the open end of the structure which is placed facing a fast-flowing stream. They are swept along the length of the cage till they are trapped in the conical *huppi*.

Other Fish Traps

Other smaller fish traps with similar structure are also used. These are basically variations of cylindrical forms with one open and one closed end. A Manipuri trap is called *parun* for which the Bengali name is *cheppa*.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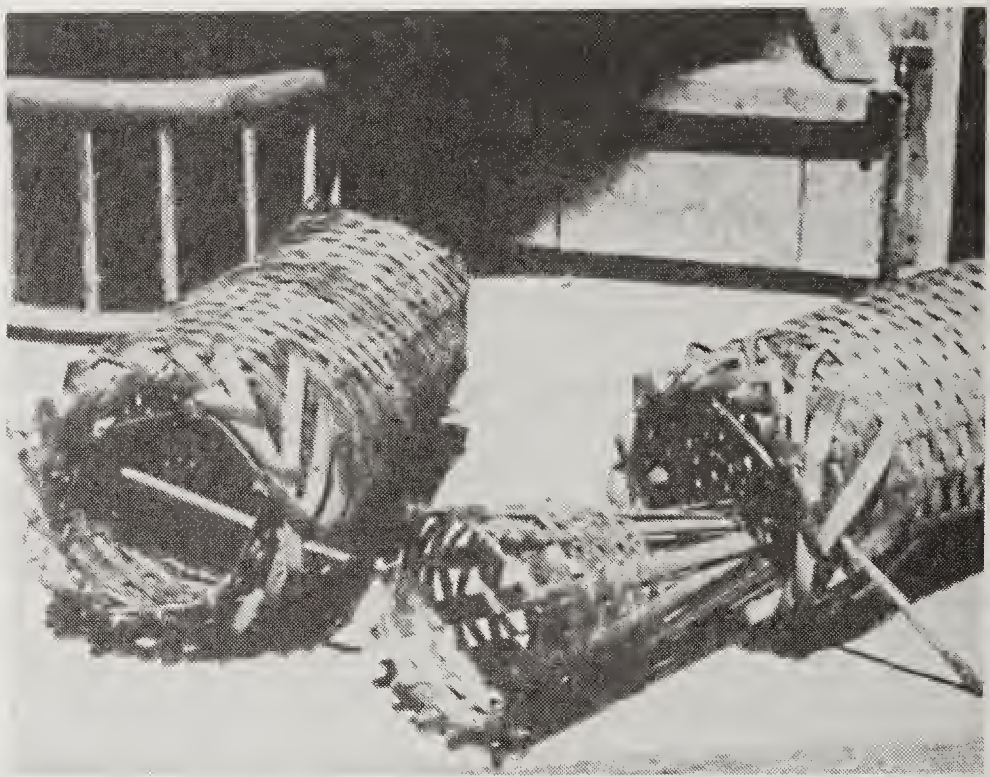
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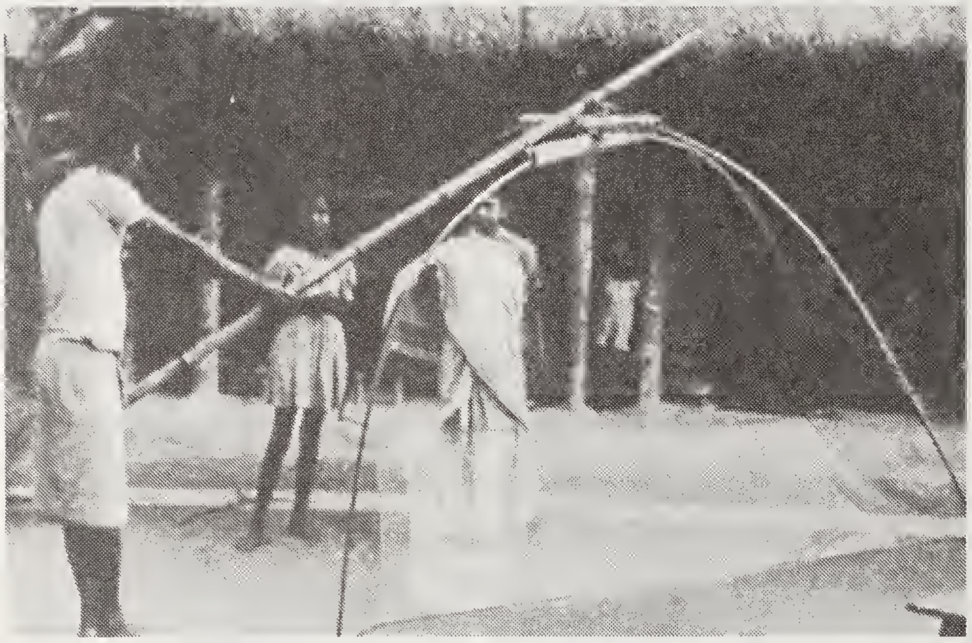
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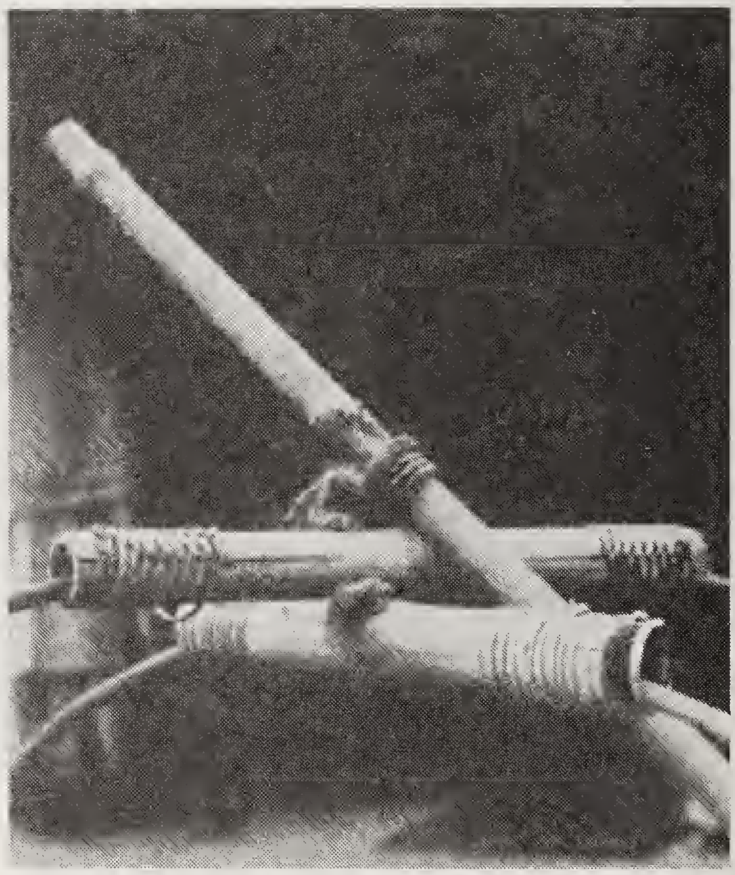
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651: The *paikur*, a fish trap from Mizoram.

652: Another Mizo fish trap similar to the *paikur*.

653: An Assamese man demonstrating the use of a fish net stretched on a dismantling bamboo structure.

654: Detail of the bamboo structure.

655: The *dulla*, a fish basket from Tripura.

656: A variation of the *dulla*.

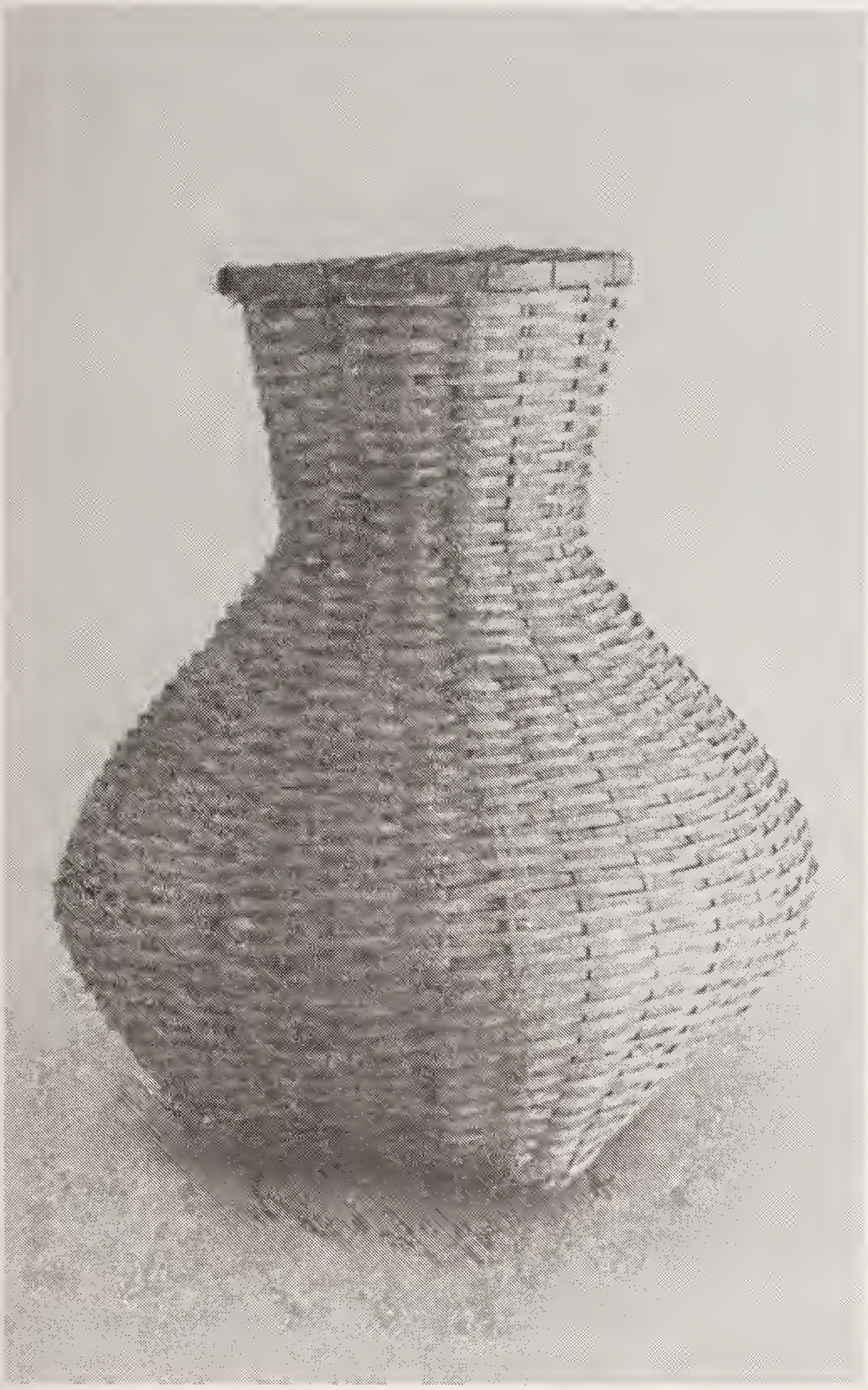
657: A composite diagram showing the base and construction of the *dulla*.

Constructed by tying parallel strips of bamboo together, the closed end can be formed by a separate surface that blocks the end, or by bringing all the strips together at a point. Some traps are closed on both sides of the cylinder, by flattening it to form an edge at both ends (fig. 649). These have the opening on the surface of the cylinder.

The opening for the fish, whether it is at the end or on the surface of the cylinder, has a cane or bamboo structure, in the form of spikes, blocking it. This acts as a valve, allowing the fish to enter, but not to leave the trap. In some cases there are two of these spiked cones within the fish trap to act as safety valves (fig. 650).

The Mizo *paikur* is a bottle-shaped structure with a conical spiked valve at the mouth. This again only allows the fish to enter the bottle. The fish can be collected by removing the spiked cone when required (figs. 651, 652).

Other fish traps are made from a combination of bamboo lengths and fish net. The bamboo structure is used both to spread the net and to raise or lower the fish net (figs. 653, 654).



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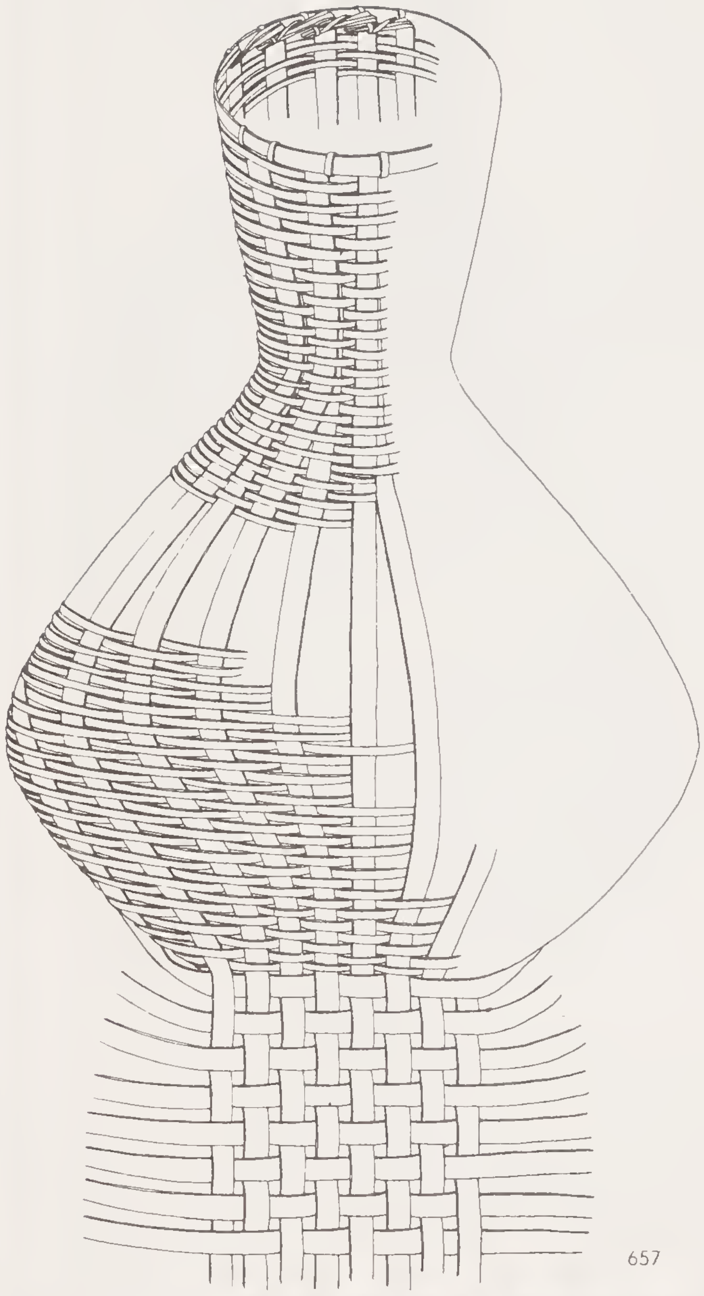

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Fish Baskets

Dulla

This is a fish basket from Tripura (figs. 655, 656). The square base is woven in an open basket weave with 15 strips of bamboo, seven in one direction and eight at right angles to them. The strips extend outwards from all sides of the base so that they can be turned up to form the stakes for the body of the basket. The corners of the base are prominent because the strips are bent upwards at that point. The distance between the stakes is varied according to the shape required so that they are farthest apart at the maximum diameter of the basket.

The narrow neck is formed by overlapping two stakes, thus reducing the total number by half. As there are an even number of stakes, two strips of bamboo are woven between the stakes, each strip forming alternate horizontal rings. The stakes are folded over at the top rim and tied to an additional ring of bamboo (fig. 657).

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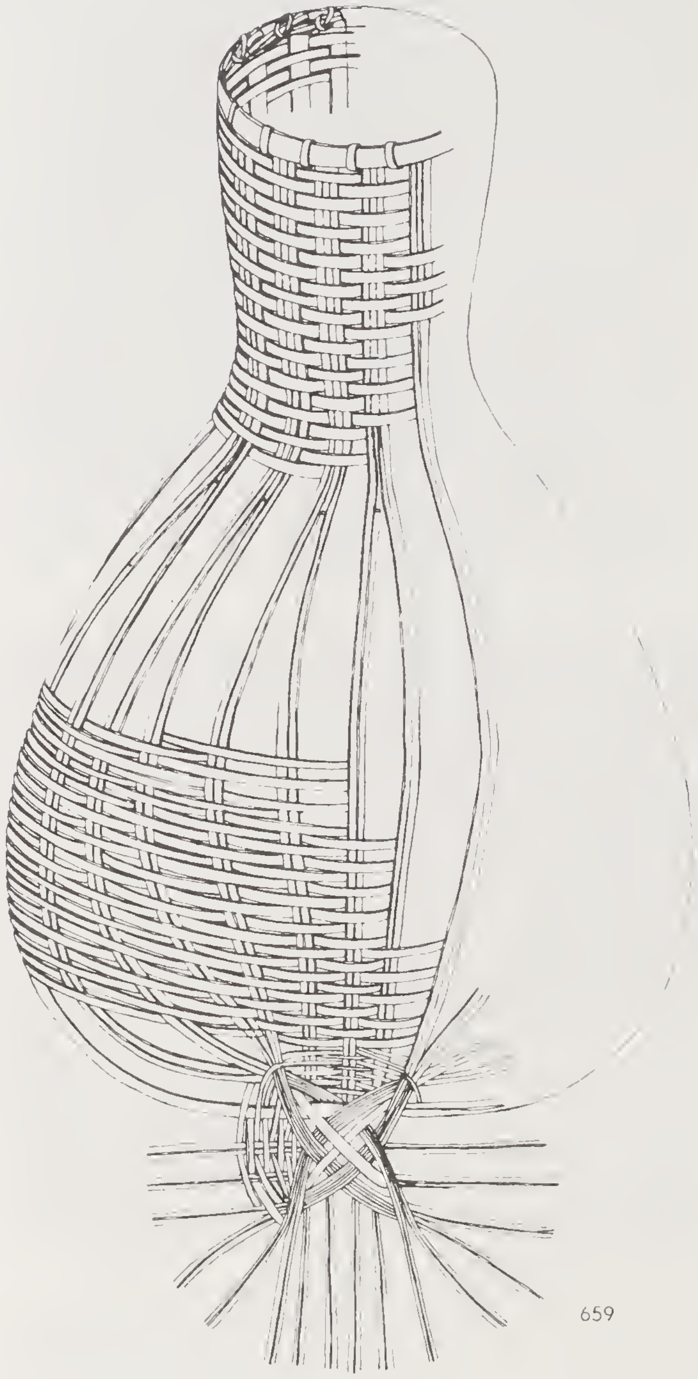

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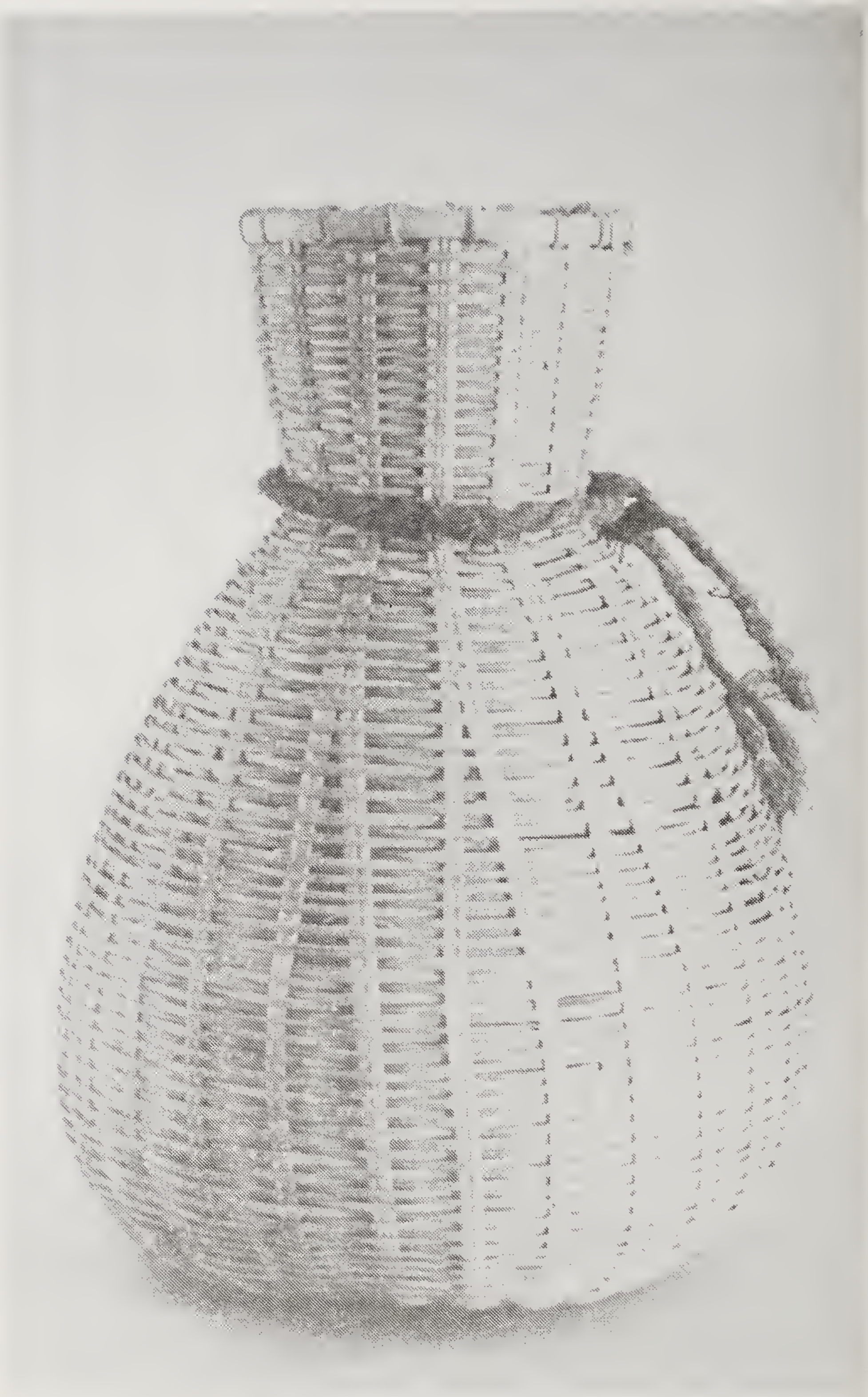

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658: The fish basket from Assam.

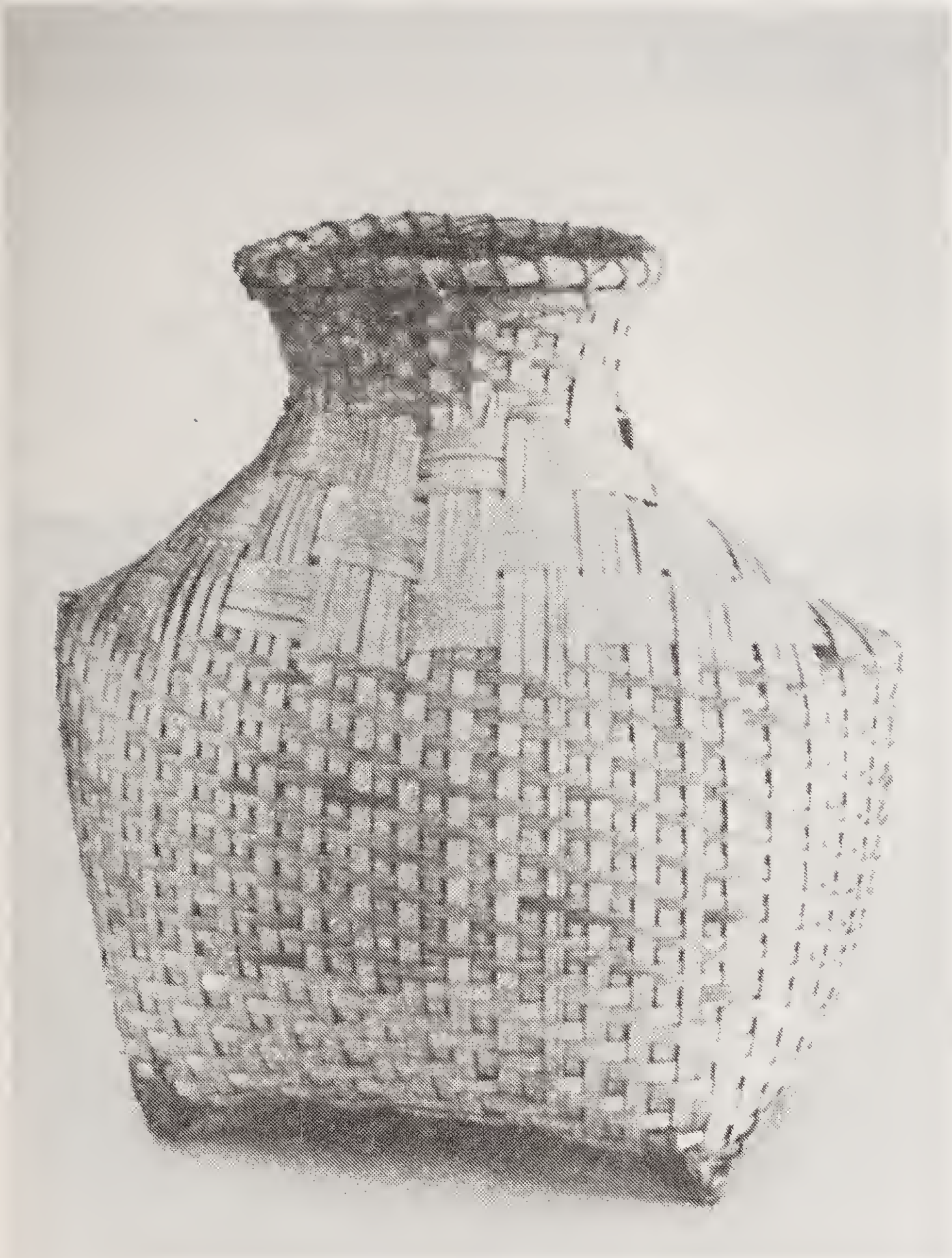
659: A composite diagram showing the base and construction of the fish basket.

Fish Basket from Assam

The fish basket from Assam has an interesting base (fig. 658). Six strips used in two sets of three at right angles are interwoven in a loose basket weave. Another base is made with eight additional strips arranged to form four curved diagonals. The two bases are pinned together with diagonal bamboo sticks. The bamboo strips of both bases extend beyond the base, and these are turned upwards to become the stakes for the body of the basket. One additional stake is introduced in one corner so that there are an odd number of stakes. The shape of the basket is controlled in the same way as the *dulla* (fig. 659).

Tungol

The *tungol* is a Manipuri basket that is used to store freshly caught fish (fig. 660). It has an interesting form that results from its unique construction. Strips of bamboo are interwoven to create a rectangular base and are turned upwards at the periphery of the base to provide the vertical members for the body of the basket. The corners thus formed are reinforced with a cane binding and the base itself is strengthened along its diagonals by two bamboo splints.



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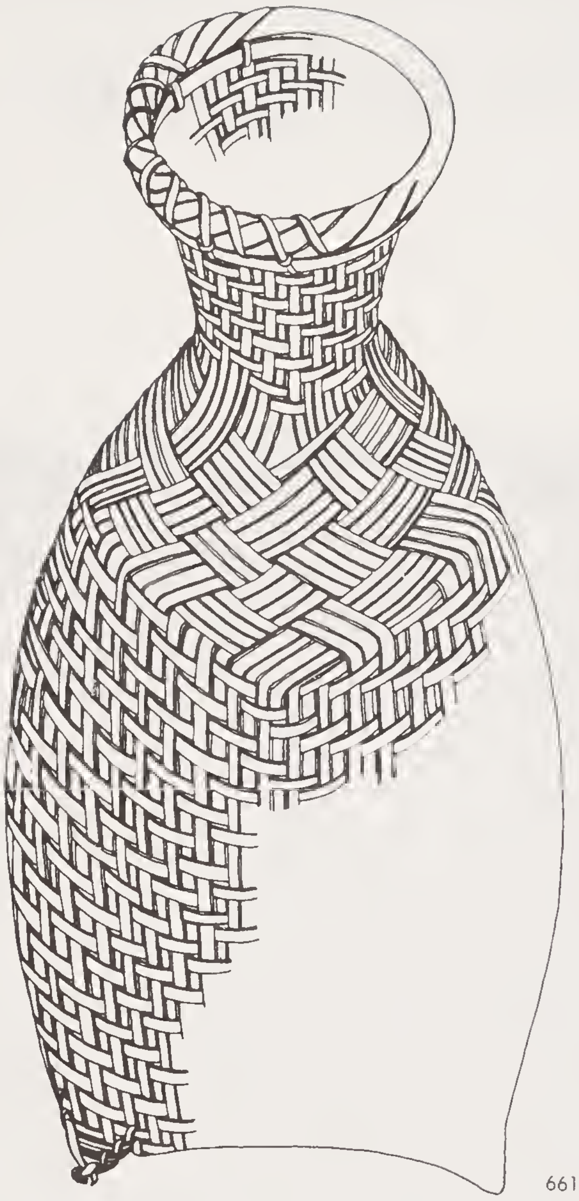

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660: The *tungol*, a Manipuri fish basket.

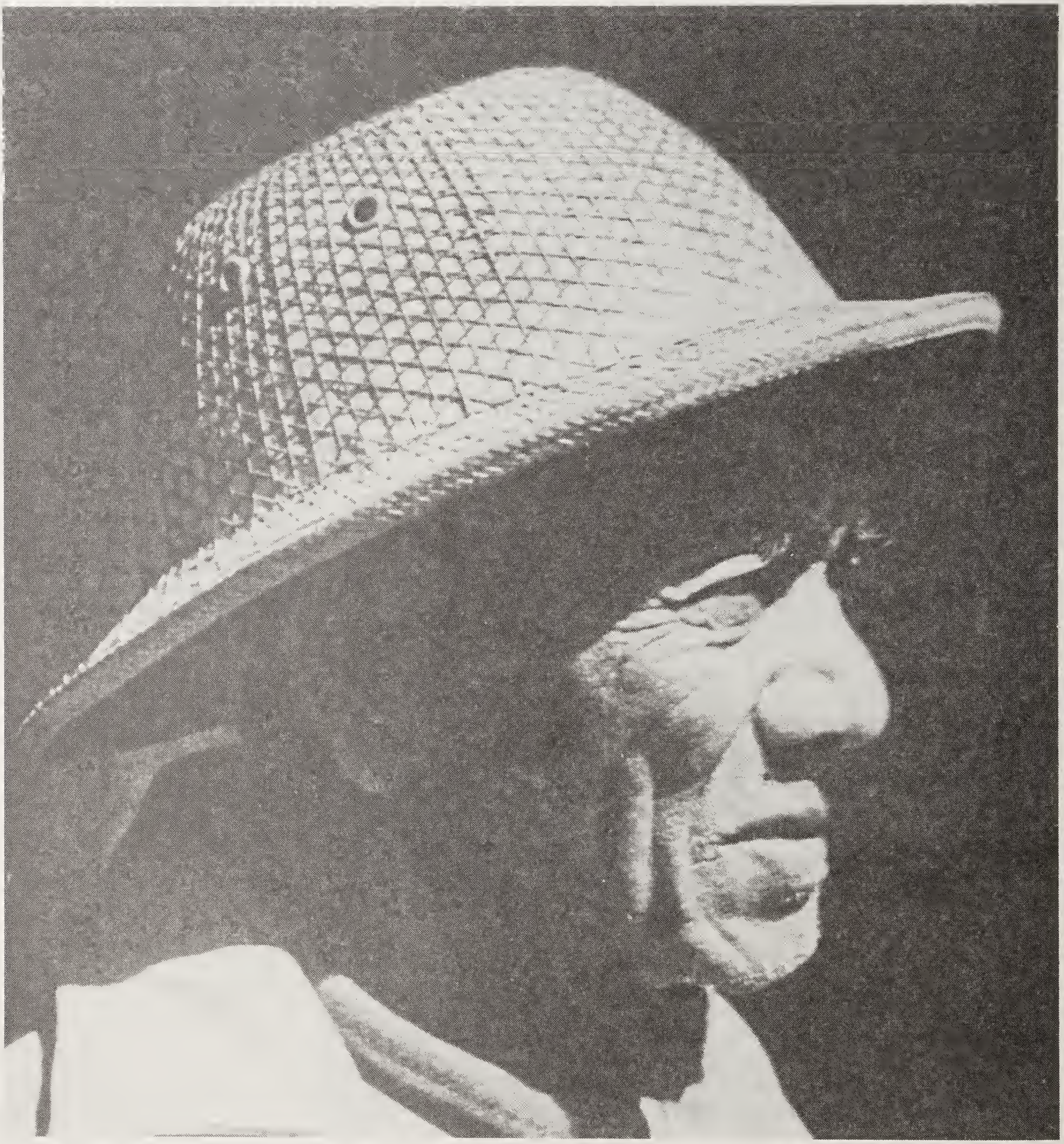
661: A schematic diagram showing the construction of the narrow neck of the *tungol* seen from the side.

Weave Structure

The body of the basket is created by a horizontal strip of bamboo weaving a twill pattern between the vertical members upto a certain height (fig. 661). At this point, the weft strip is ended, and the vertical members are grouped into sets of four, each set acting as a single member. Corners are created at the centres of the short side of the rectangular body by bending three sets on either side of these centres in opposite directions so that each set follows the length of the basket opposite to it. The vertical members remaining on the longer side of the rectangular body continue upwards to form the neck after being woven into the sets that move horizontally.

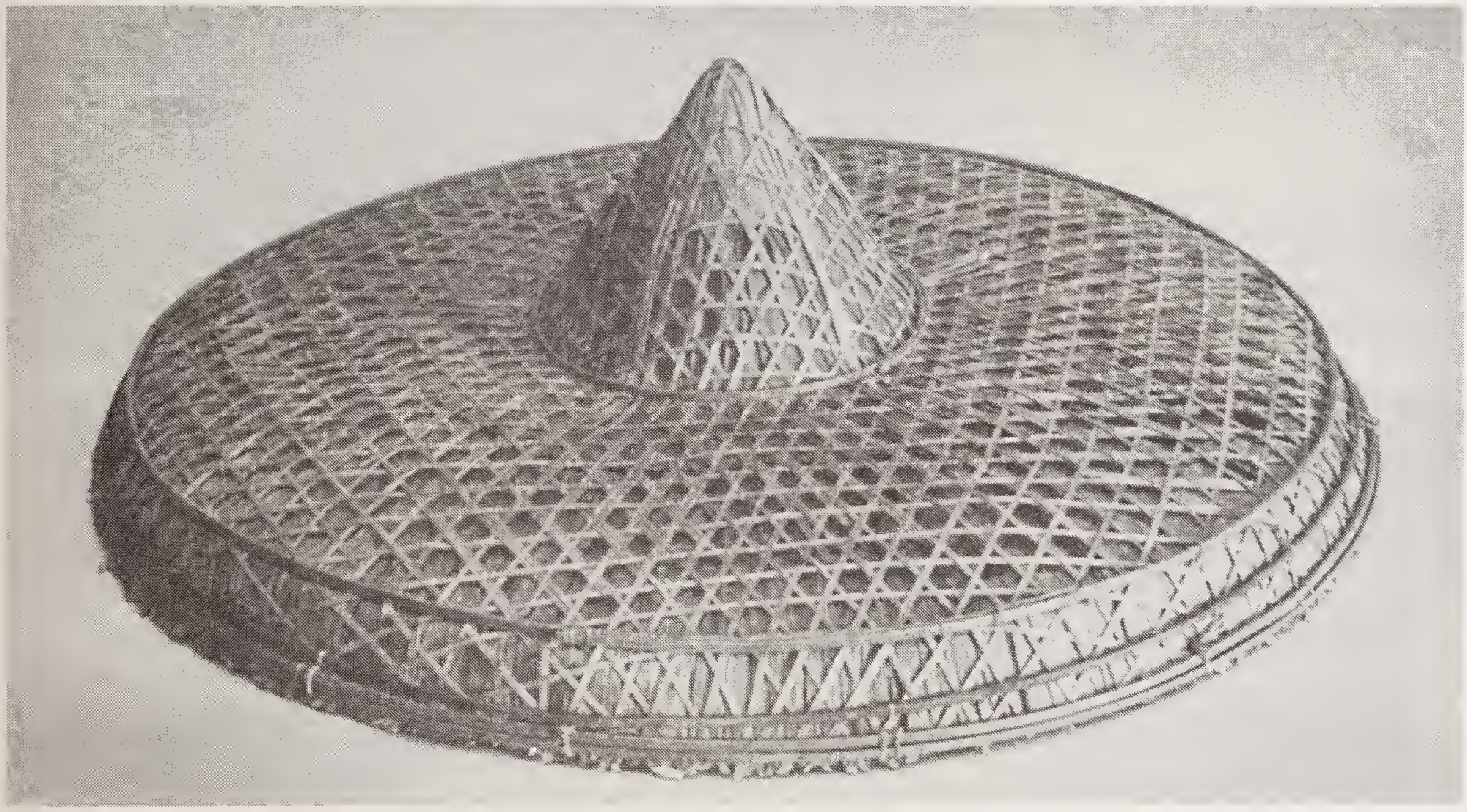
This interweaving creates an inclined surface that meets the narrow neck. The ends of the horizontally arranged vertical staves overlap at the centre on the longer side, on either side of the neck. This construction causes a reduction of the number of vertical staves at the neck. Another horizontal strip resumes weaving between these staves to form the neck upto the rim. This is then strengthened by twisting the ends into a ring and tying it to a thin bamboo ring.

Rain Shields and Headgear



Rain Shields and Hats

The northeastern region of India has heavy rainfall between May and September, which is also the time when the people of the region work in their fields. Because they need protection from sun and rain, they have developed various types of headgear for this purpose. Most of these are made by sandwiching a layer of dried leaves between two layers of a bamboo net-like structure. They are usually made in an open-hexagonal weave which creates a strong surface with the minimum use of material. The dried leaves provide the waterproofing.



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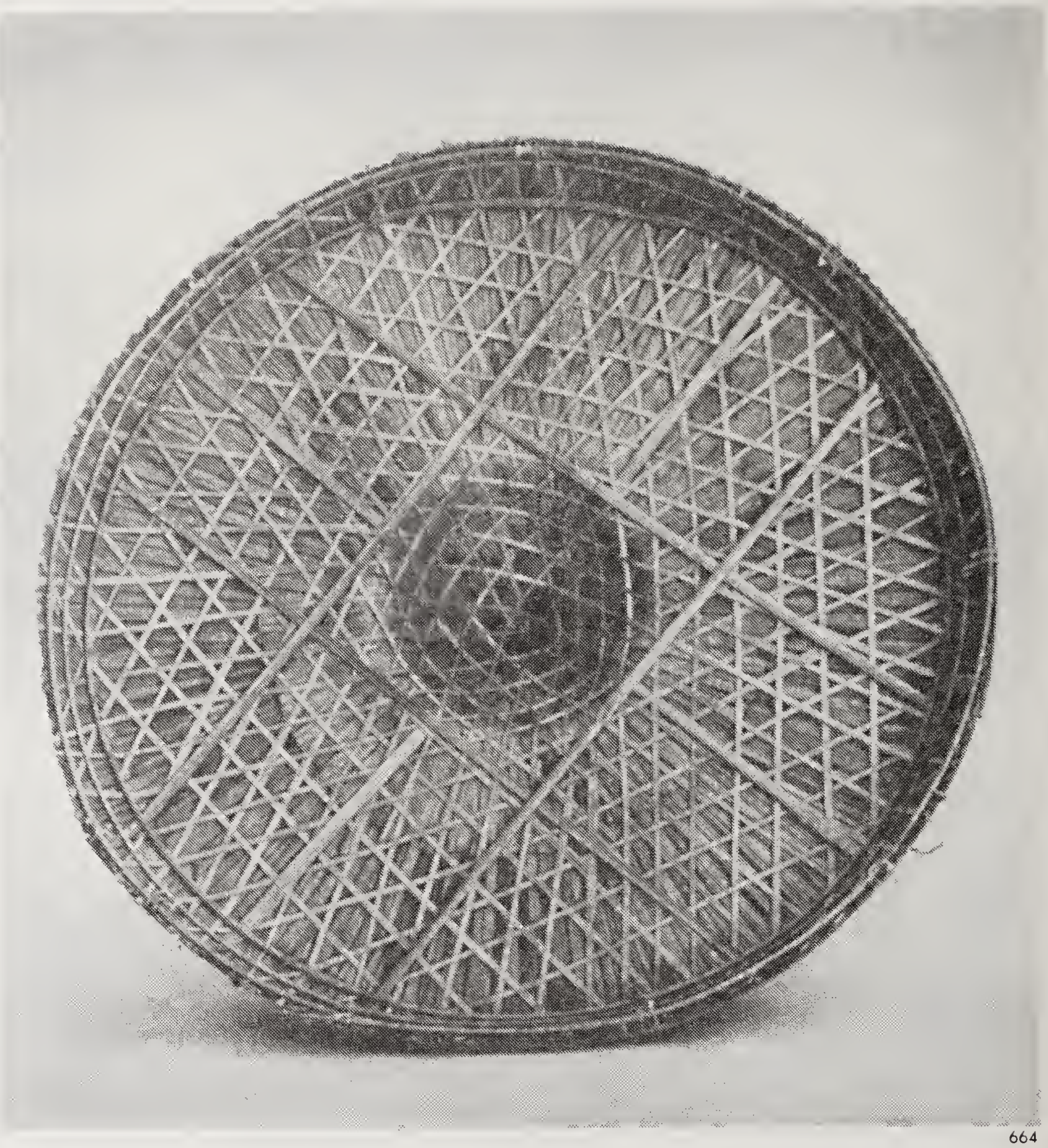
662: The *jhappi*, a rain shield from Assam.

Jhappi

The Assamese *jhappi* is a rain hat which is a wide circular horizontal shade around a small cone (fig. 662). The cone has a base of 200 mm and height of 100 mm, and the diameter of the shade is 625 mm. The edge of the shade is turned down to form a vertical rim 50 mm wide.

Structure and Construction

The cone of the *jhappi* is formed over a mould made of bamboo slats (fig. 663). Five bamboo strips are arranged around the apex to form a pentagon. Subsequent strips of bamboo are arranged on the surface of the cone, more or less parallel to the first five to create a semi-regular grid of triangles and hexagons. The strips continue onto the horizontal shade, from



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663: A semi-finished *jhappi*, the mould used for the cone top, and the palm leaf that is sandwiched between the layers.

664: The *jhappi* as seen from below.

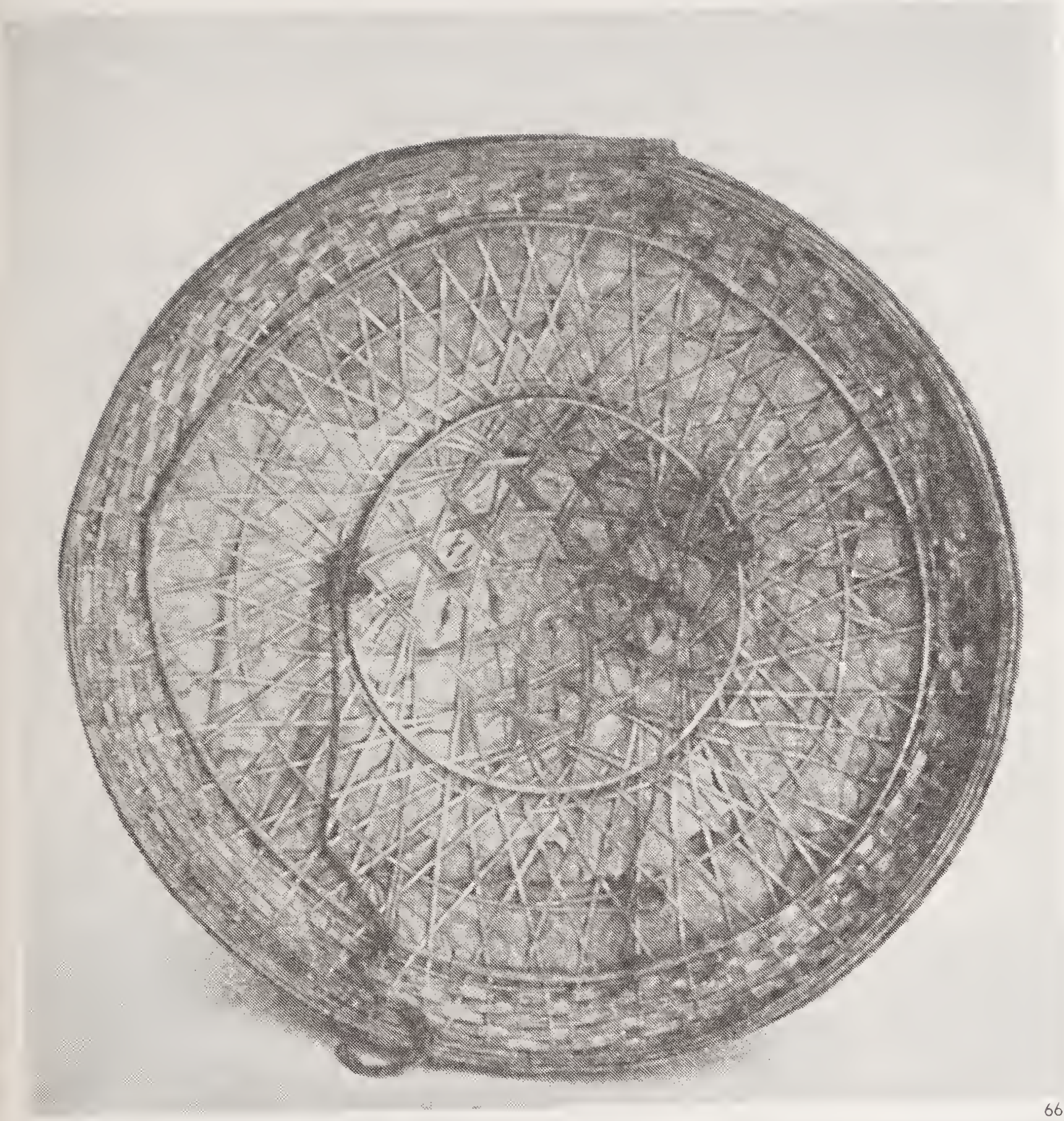
663

where they are extended outwards by additional bamboo strips arranged with overlapping ends. All the strips are interwoven and held in place. Two similar layers of the bamboo net are made, the inner one being a little coarser than the outer. The tip of the outer cone is strengthened by five elements passing over the apex.

Dried palm leaves are radially arranged on the inner net, from the apex outwards. There are three layers of leaves over the cone, while the shade has one layer. The outer net is placed over the leaves, and the three layers are tied with string to a bamboo ring encircling the base of the cone. Two other bamboo rings sandwich the layers of the shade at the point where it is to be bent vertically downwards, to form the rim. The *jhappi* is strengthened on the inside by four bamboo splints, enclosing the base of the cone tangentially in a square, and extending towards the rim. Four additional shorter splints are added to lie from the centres of the square sides towards the rim (fig. 664). After the hat has been strengthened, the edge of the shade is bent downwards to form the short vertical rim which helps to strengthen the shade. The edge of the rim is then sandwiched between two bamboo rings, tied with string. The *jhappi* is fairly crudely made, but it serves to protect the wearer from sun and rain.

Decorated *Jhappi*

A decorative version of the *jhappi* is made on a much larger scale as well as on a miniature scale. These are decorated with bits of coloured cloth or paper and hung on the walls of Assamese houses on festive occasions. Often paper is used instead of leaves between the two layers of bamboo net so that the decorations show up on a white surface.



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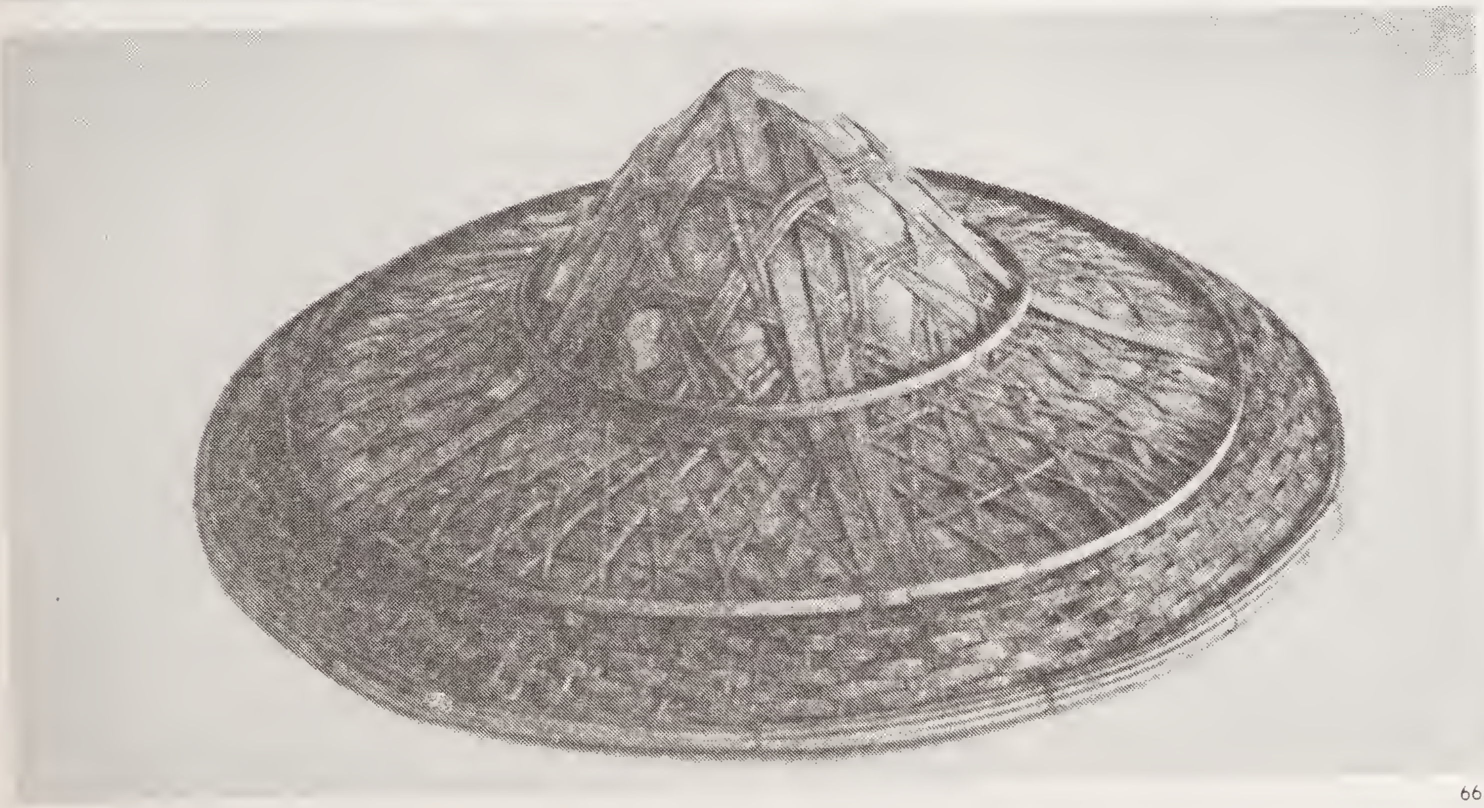
665: The *pathla*, a rain shield from Tripura.

666: The *pathla* as seen from below.



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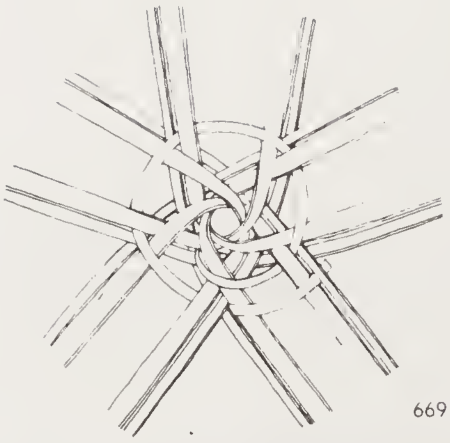
Pathla

The *pathla* from Tripura is similar to the *jhappi* though not as wide (fig. 665). The top cone has a base of 230 mm with a height of 110 mm, and the circular shade which is angled slightly downwards has a diameter of 550 mm. As in the *jhappi*, the apex of the cone is encircled by a pentagon made up of five elements, each of which has three strips of bamboo. The subsequent hexagons on the cone are also made with three strips to each element. As the base extends into the shade, the strips are separated and move independently across the shade in a rhombic pattern. Two bamboo rings, fairly widely spaced, are interwoven into these strips to hold them in place. The last 50 mm at the end of the shade has a strip of bamboo woven between them in a closed-basket weave which helps to strengthen the rim.

Two such layers are made and put together, sandwiching large dried leaves between them. The three layers are sandwiched between bamboo rings at three places, at the base of the cone, at the point where the basket weave begins and at the edge of the shade (fig. 666). The last ring is made up of four narrow rings, which are easier to bend than a single thick one. The width of the first two rings is oriented vertical to the shade, and all the tying is done with wire. The apex of the cone is strengthened by five wide interlocking strips of bamboo which pass near the top and continue down the cone along the shade upto the basket weave. These strips are held in place by introducing them into the weave on the cone.

Chatta

The *chatta* from Cachar District in Assam is the simplest of the rain hats mentioned so far (fig. 667). It is a very shallow cone made with a layer of palm leaves sandwiched between two layers of an open-hexagonal weave made with strips of bamboo (fig. 668). The cone shaped hexagonal net is made as in the *jhappi*, with a pentagon at the apex, followed by a grid of triangles and hexagons. The rim is finished with a basket weave as in the *pathla*. The two layers are identical except for five additional interlocking strips used to strengthen the apex of the top layer (fig. 669). A fine strip of bamboo is woven between these strips at the apex to hold them in place, after which the ends of the strips are introduced into the hexagonal weave. The two layers with the leaves are held together only near the edge, where they are tied onto a bamboo ring on the top layer at the point where the basket weave begins. The cut edge of the *chatta* is finished by a ring made up of three narrow strips of bamboo loosely twisted together. This is tied onto the edge with the same strip of bamboo used to hold the layers together.



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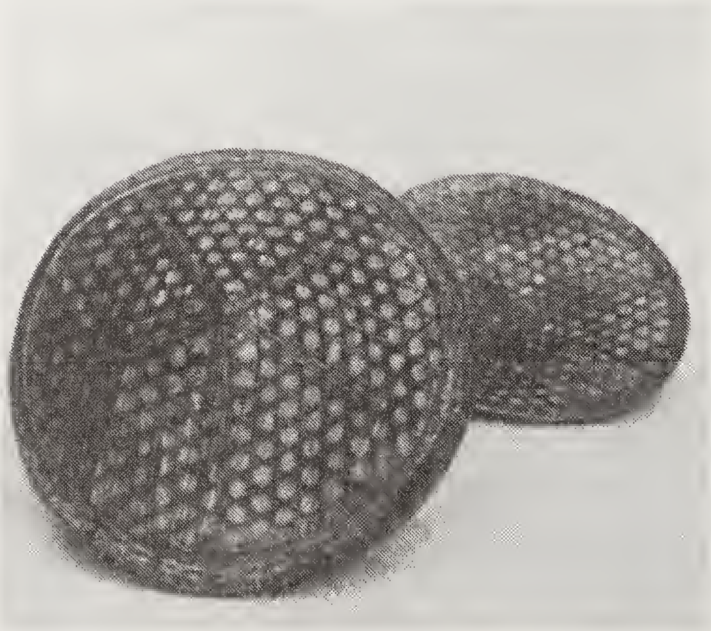

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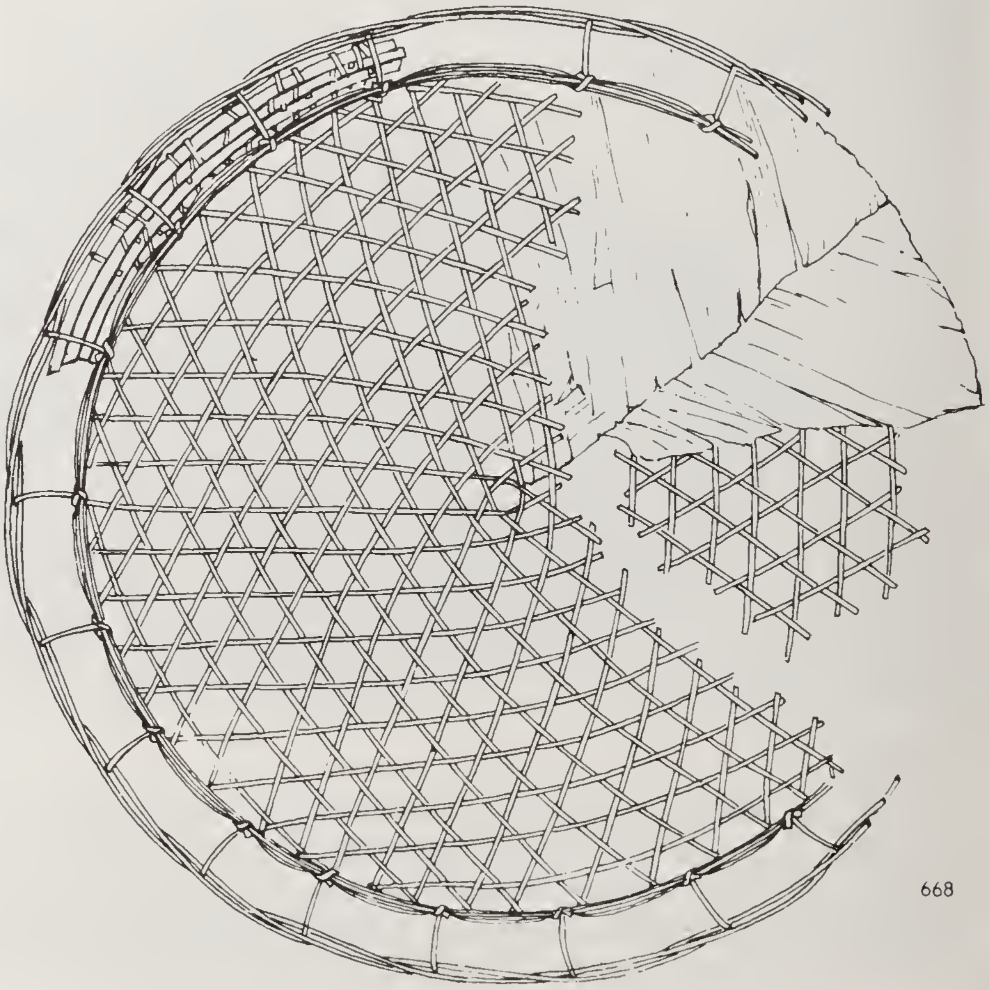

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667: The *chatta*, one of the simplest rain shields from Assam.

668: A cutaway view showing the palm leaves sandwiched between the two layers.

669: Detail of the additional strips used to strengthen the conical tip of the *chatta*.

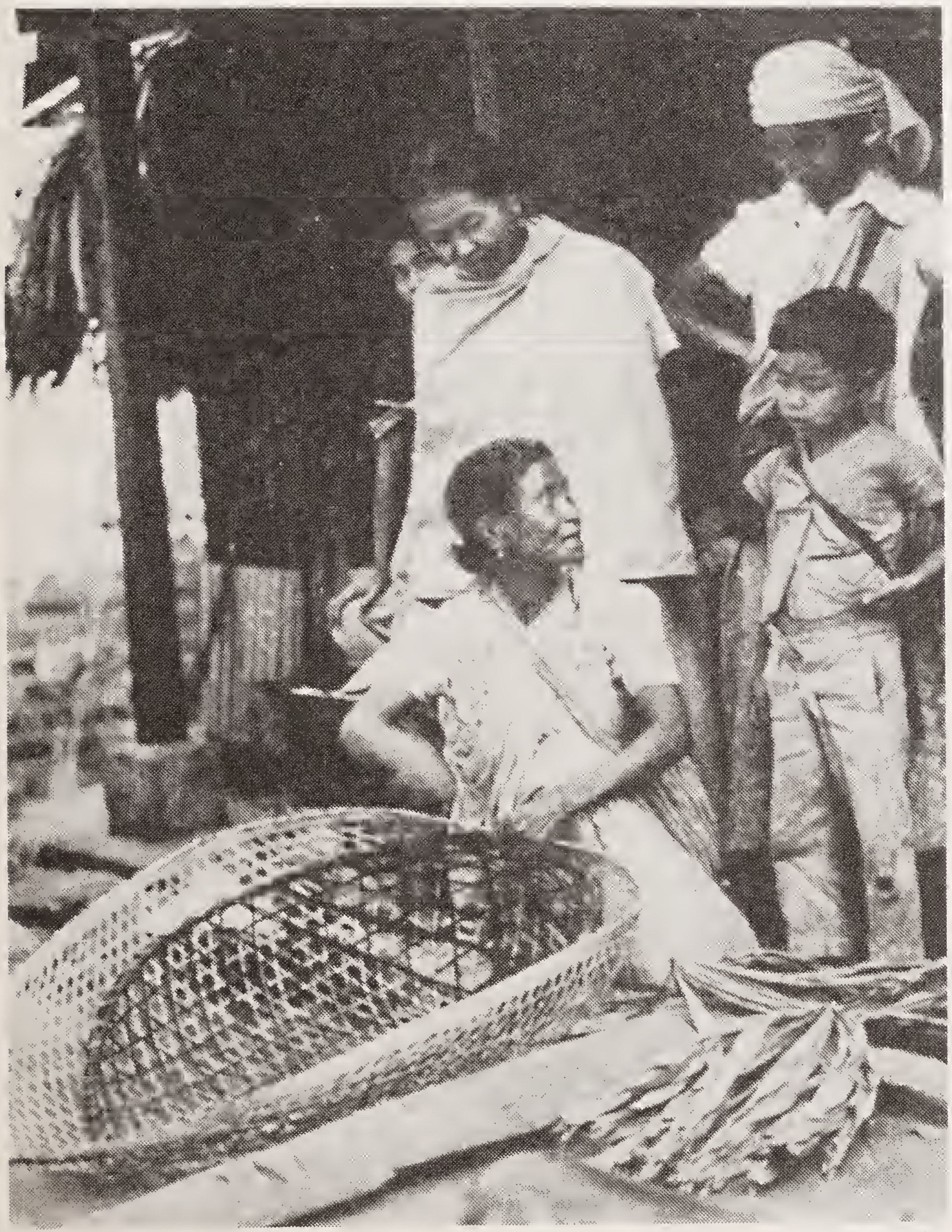
Knup

This is a Khasi rain shield used in Meghalaya near Cherrapunji, which has the highest recorded rainfall in the world. The *knup* is shaped like a hollow, shallow cone, with half the circumference of the base greatly elongated to terminate at a point (fig. 670). The rim of the rain shield, therefore, looks like an inverted tear drop. When it is worn, the curved surface of the cone rests on the head, the apex protrudes behind the head and the elongated surface completely covers the back.

The *knup* is made in two layers, each woven in an open-hexagonal weave. Two layers of palm leaves are sandwiched between the woven layers to provide the water-proofing.

Each layer is woven from strips of *shken*, a reed bamboo, over a sturdy mould made from bamboo splits (fig. 671). The mould is used to standardise the size and shape of the rain shield. A good mould would last about five years in regular use. The weaving is begun at the apex with two angular sets of elements woven into a vertical set to produce an open-hexagonal weave. The outer layer is formed first in a coarse weave with fairly large hexagons. At the edge, each split is folded back along the rim and woven a short distance, through the other elements. This results in a compactly woven edge all around the rain shield. The inner layer is made in a similar manner, but the strips are finer and the hexagons smaller.

After both layers are complete, dried palm leaves called *shlew* are tacked with bamboo pins onto each layer independently so that, when the layers are fitted together, two layers of leaves are sandwiched between them. All the layers are held together with bamboo pins, while the edges are sewn together with a fine split of bamboo.



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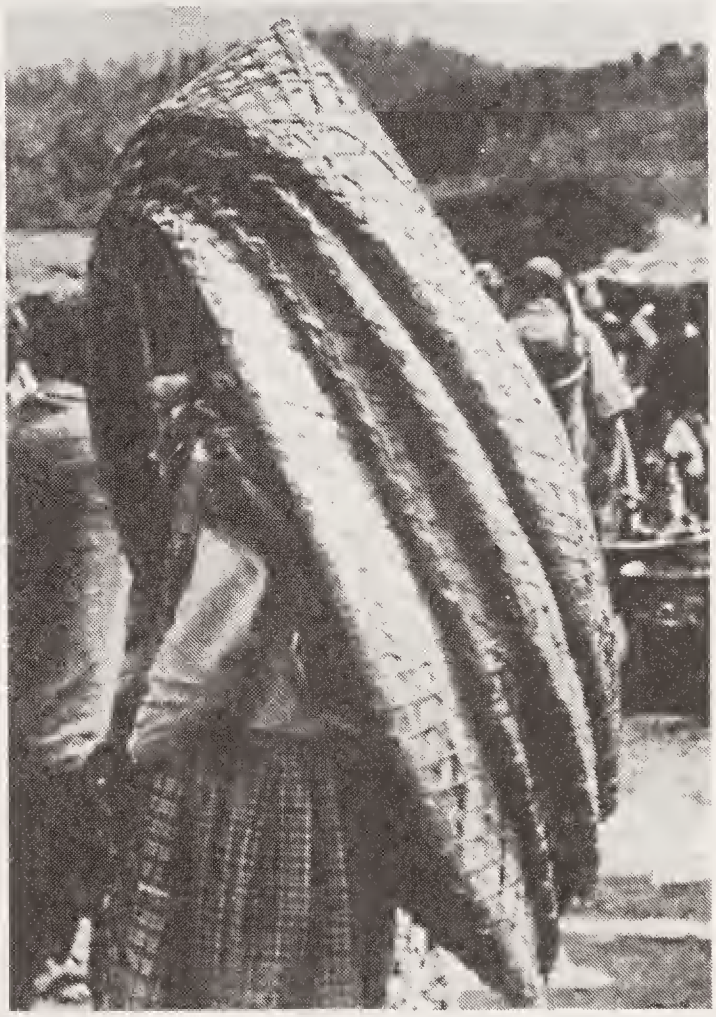

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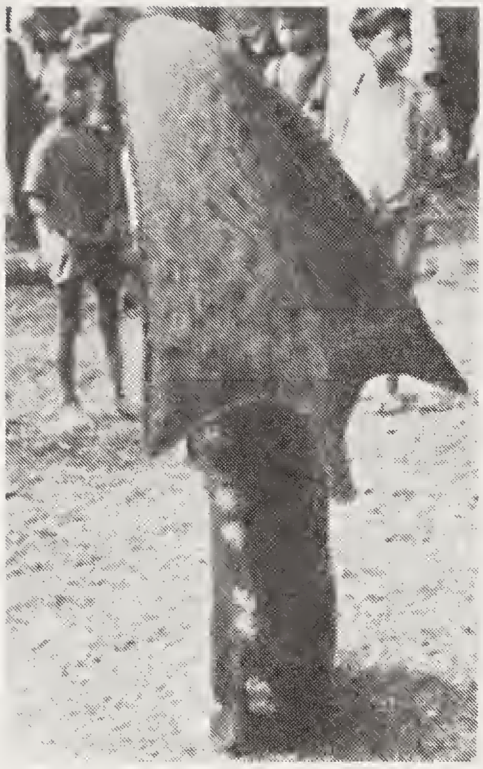
670: A Khasi woman carrying several *knups*. They are being carried in the way that they are worn.

671: A Khasi woman demonstrating the use of the bamboo mould in the construction of the *knup*.



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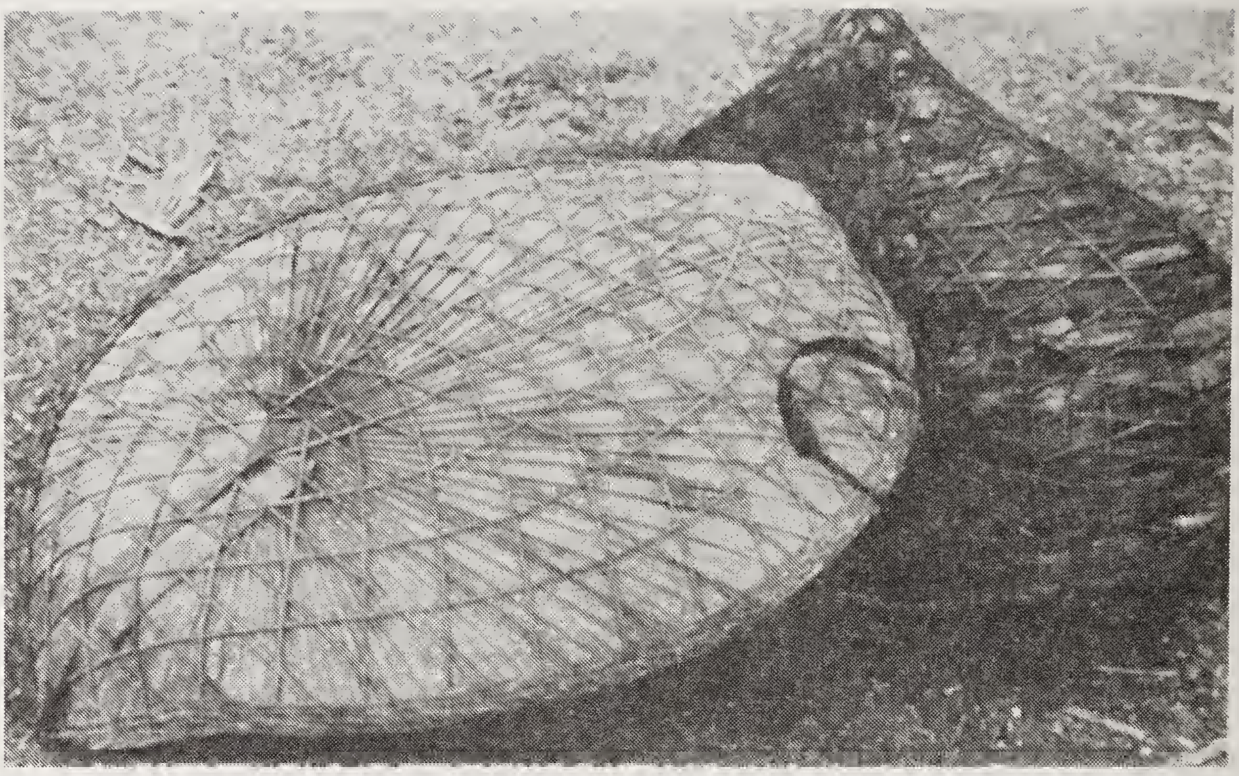

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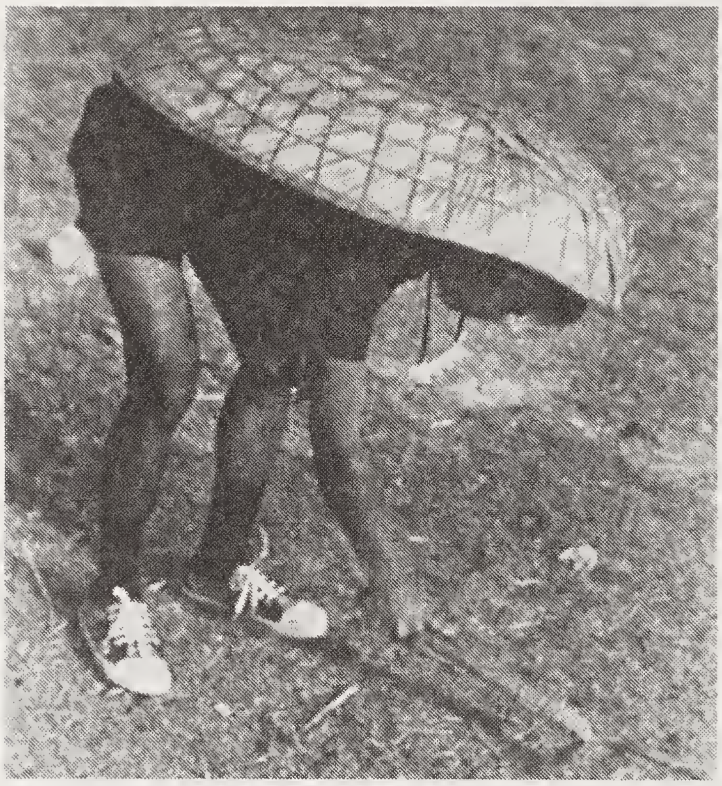

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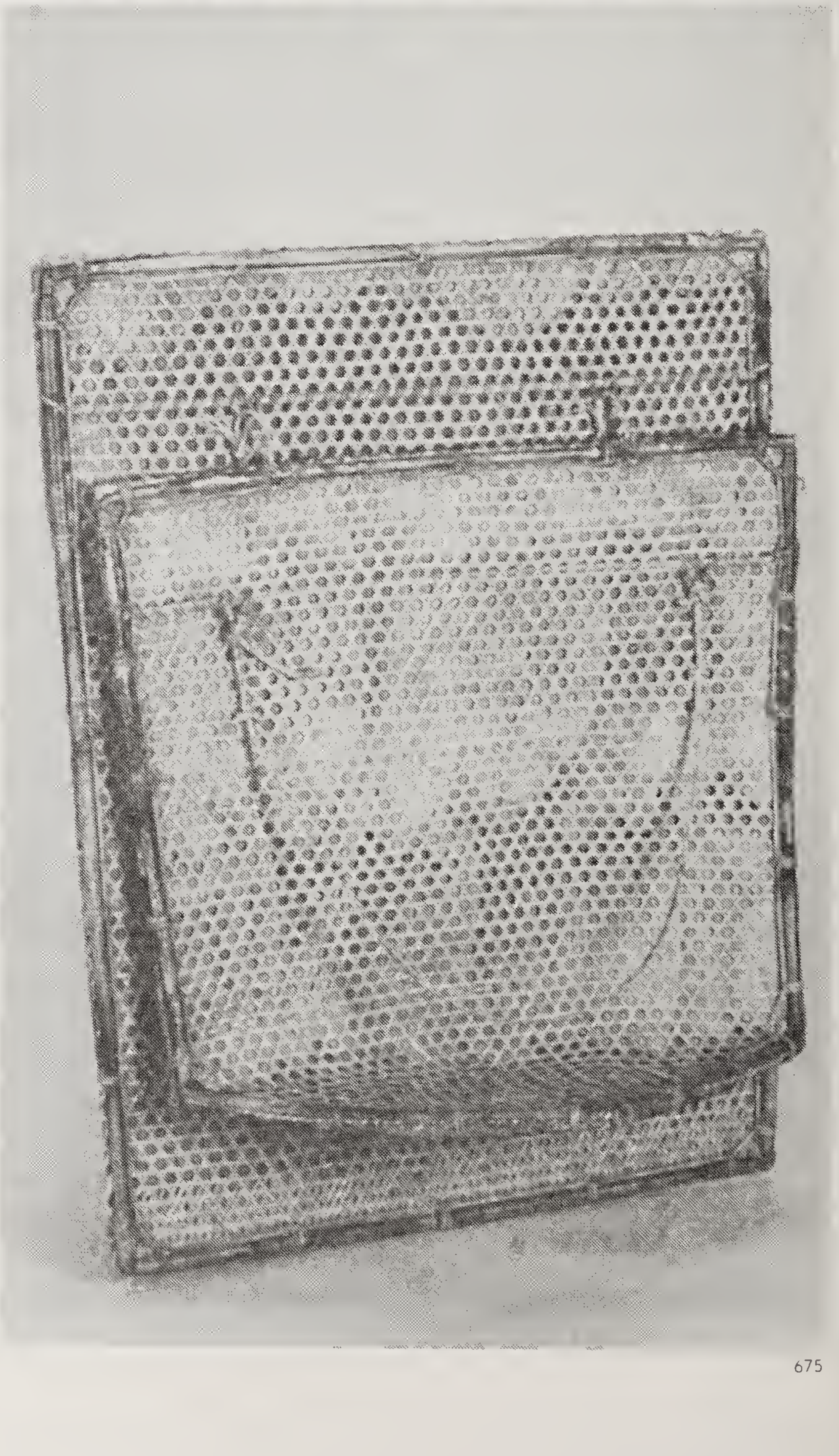

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672: The finely woven Konyak Naga rain shield with the three drip points.

673: A couple of coarse Konyak Naga rain shields.

674: The way these rain shields are worn.

675: The *yatee*, an Apa Tani rain shield, showing the top part in its folded position.

Rain Shield from Nagaland

A rain shield seen in Mon District of Nagaland was made like the *knup*, with a slight difference in form. The outer layer of the shield was made in a very fine open-hexagonal weave, while the inner layer was coarser. The lower end of the shield terminated in an interesting tail-like form, to provide three points from which the rain water could drip off the shield (fig. 672).

Another coarse version seen at Mon was shaped like a turtle shell and woven in a large open-hexagonal weave (figs. 673, 674).

Yatee

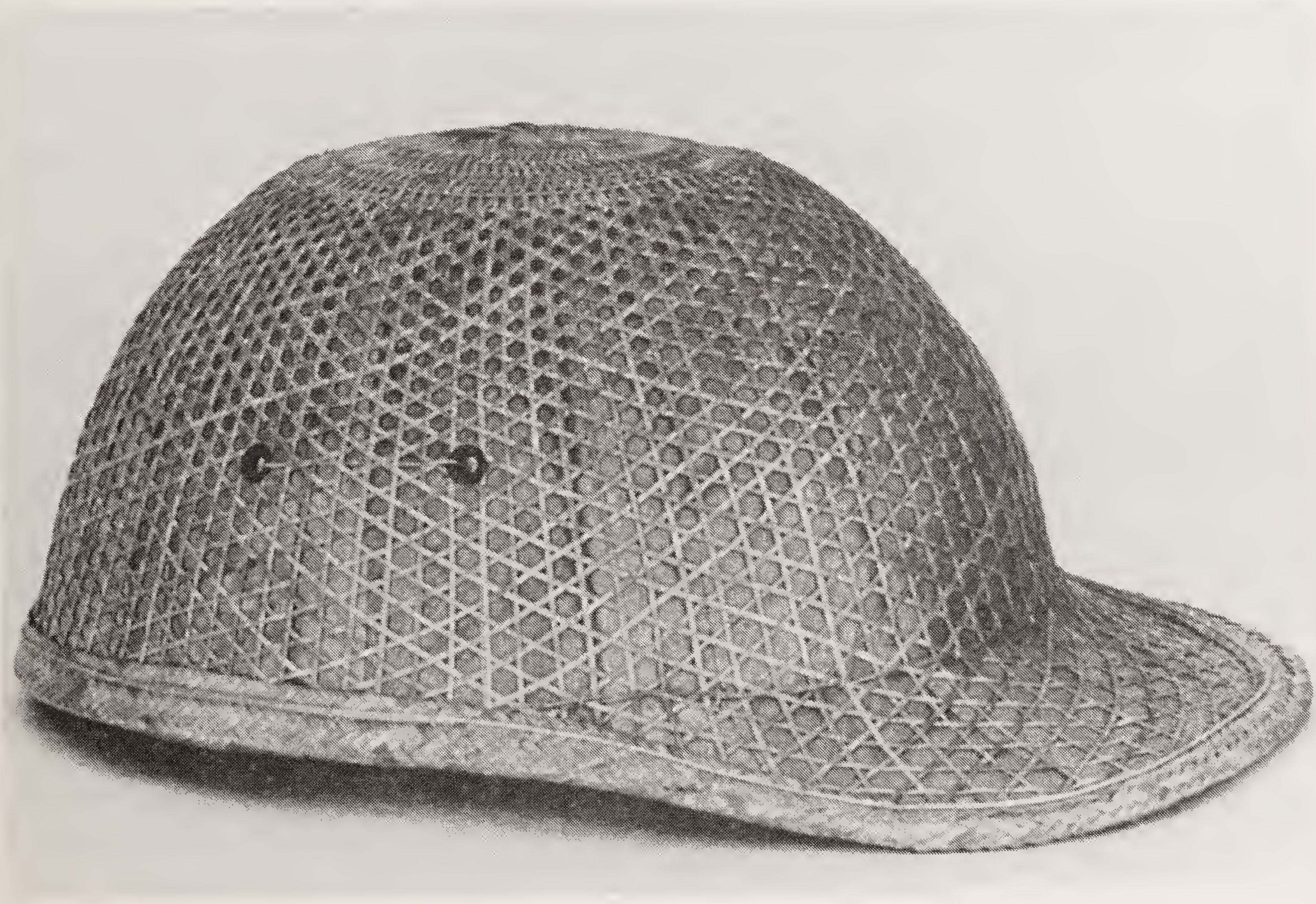
The *yatee*, the Apa Tani rain shield from Arunachal, is made in two parts, held together by long loops of twisted bamboo rope (fig. 675). The top part is rectangular, with one edge continuing into a triangular surface perpendicular to the rectangle. The triangular surface rests on the head while the rectangular portion protects the neck and shoulders. The second part is a flat rectangular piece which shields the back. Both parts have braided bamboo straps that rest on the forehead. When the top part is not required, it is pushed back to hang suspended from the back shield by two long loops of twisted bamboo rope.

Both parts are made with two layers of an open-hexagonal weave, sandwiching a layer of leaves between them. All the edges are held between two half splits of cane tightly bound together.

Lukhum

The *lukhum* is the traditional hat commonly worn by Lushai men. It is shaped like a peaked cap and retains its shape even when not in use. It is formed in two layers, each made from strips of bamboo woven in an open-hexagonal weave (fig. 676).

676: The *lukhum*, a traditional Lushai peaked cap.



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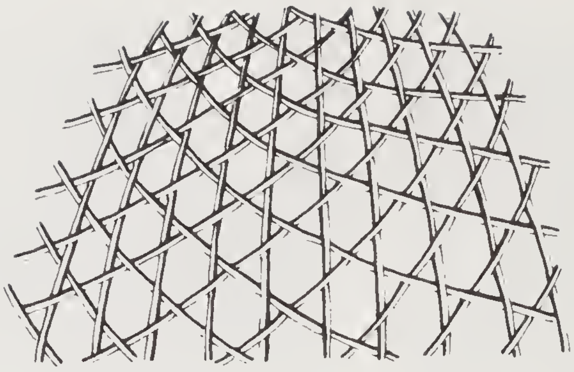

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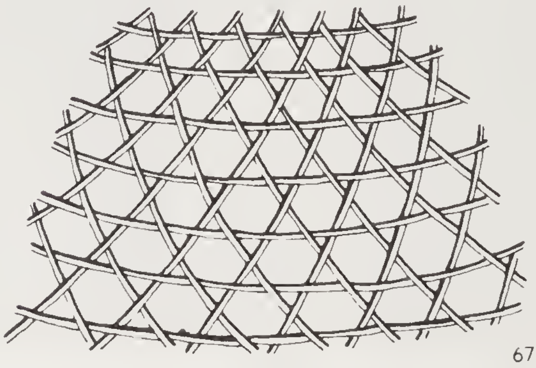

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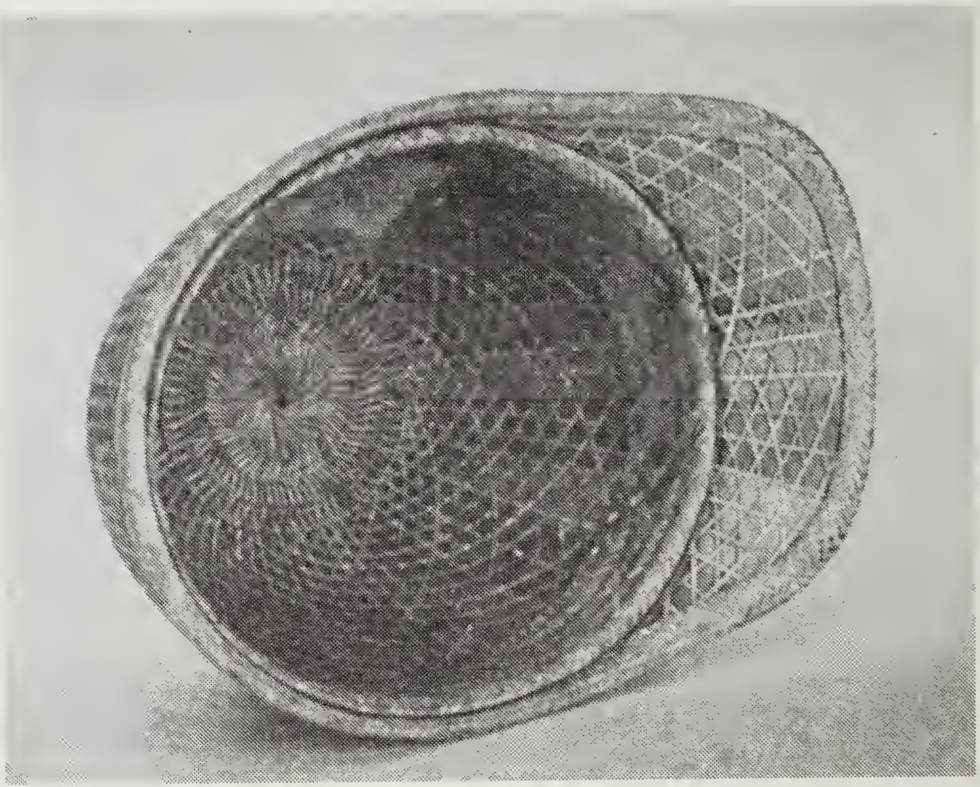


677

677: An inside view of the *lukhum*.

678: The weave structure of the *lukhum* where the strips move radially and in shallow spirals from the centre.

679: An alternate weave structure where two sets of strips are inclined in opposite directions, and horizontal bands are used to create the hexagons.

The inside layer is generally coarser than the outside layer and is woven first, beginning at the top (fig. 677). The total number of strips required are divided into ten sets which are arranged in a whirl around the centre. The strips of each set, which extend on both sides of the centre, fan out and are held in position by five concentric rings of fine bamboo strips which are interwoven between them at the top of the bowl. All the strips extend outwards at a tangent to the central point. Just below the last ring, each alternate strip moves radially along the surface of the bowl. The other strips move in a shallow spiral towards the rim. The strips on either side of each of the radial ones move in opposite directions to generate the hexagonal weave (fig. 678).

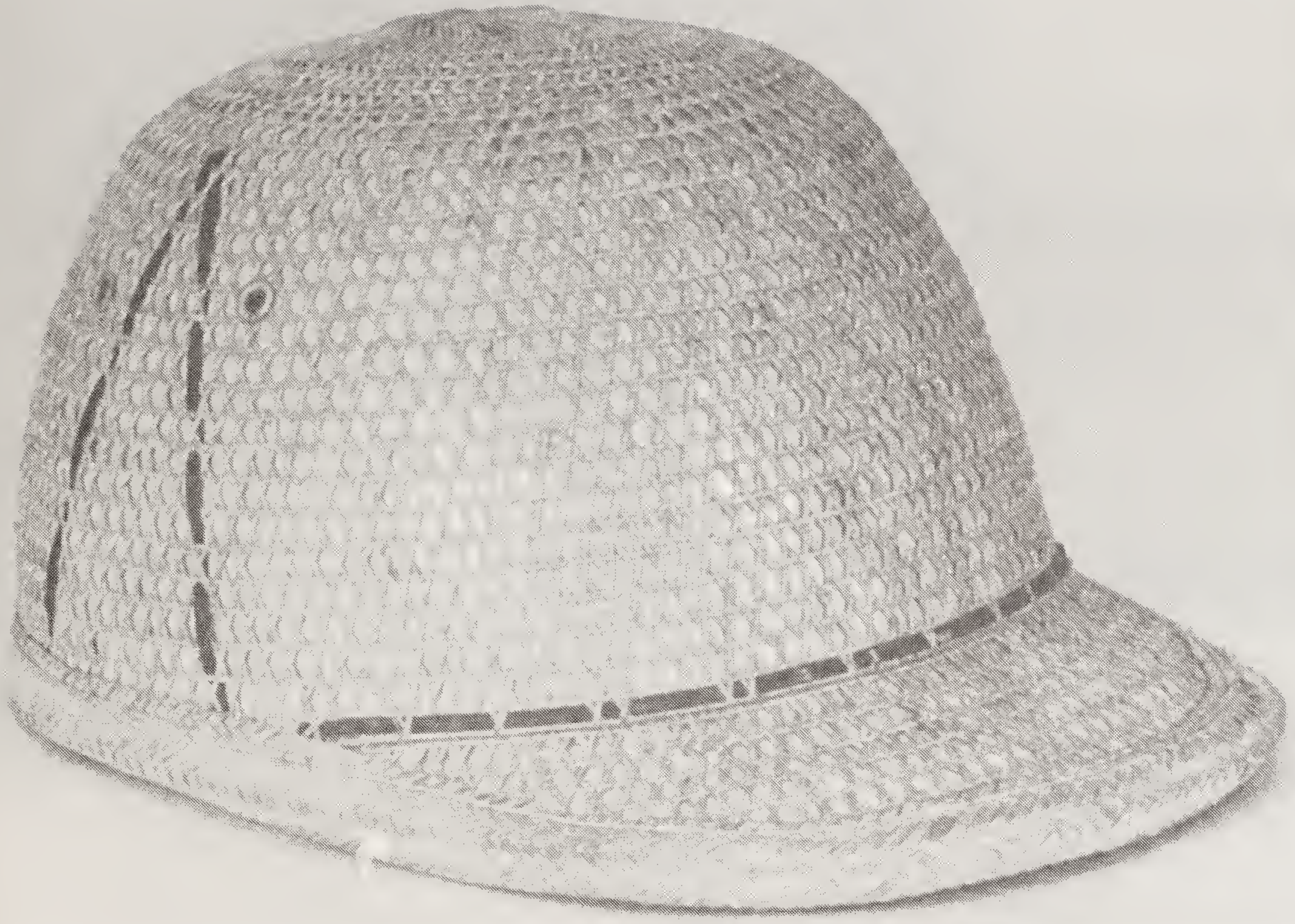
The bowl of the hat is completed so that the circumference corresponds to the required hat size. The circular rim is then deformed by a tension thread which holds the rim in an oval shape. The shape of the hat is obtained without any other aid or mould, and the fit of each hat reflects the skill of the craftsman who made it.

Some of the strips are longer in front where they extend to create the surface of the peak of the cap. At the line where the surface of the bowl is transformed into the peak, the strips of the weave are held between a pair of fine splits alternately twisted between the strips.

Another method is also used to construct the hexagonal weave. In this case alternate strips move in steep spirals inclined in opposite directions down the bowl. Here concentric horizontal bands are woven between the inclined strips to create the hexagonal weave, unlike the previous one where the alternate vertical strips themselves made up the hexagons (fig. 679).

The inner layer is used as a mould to make the outer layer, which is woven in a similar manner (fig. 680). The two layers are temporarily tied together at the top, till the outer layer is completed, after which they are separated so that a layer of dried palm leaves can be inserted between them. A piping of finely braided bamboo is fixed all along the edge, once the layers are put together again. This is made as a continuous ring which is stretched around the hat where small thread stitches passing through the layers hold it in place. A head band made of a wider braided ring of bamboo is fitted inside the bowl.

This hat is extremely delicately made, with a high quality of craftsmanship. The recent trend however is to make the hats a little coarser, with paper or plastic replacing the palm leaves between the layers (figs. 681, 682).



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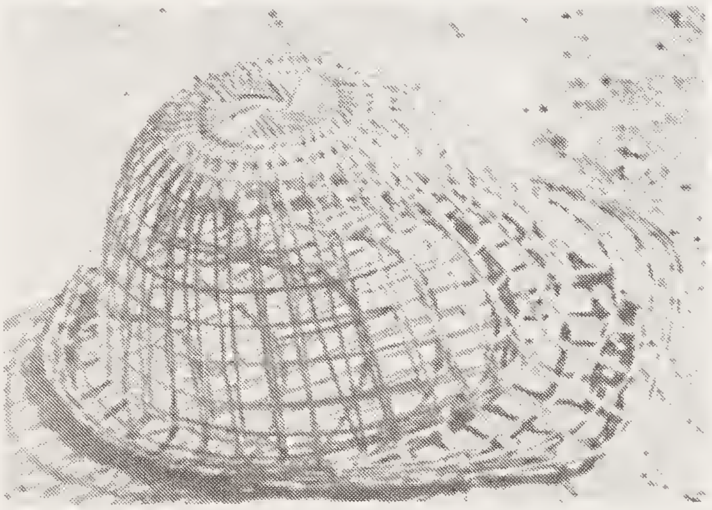

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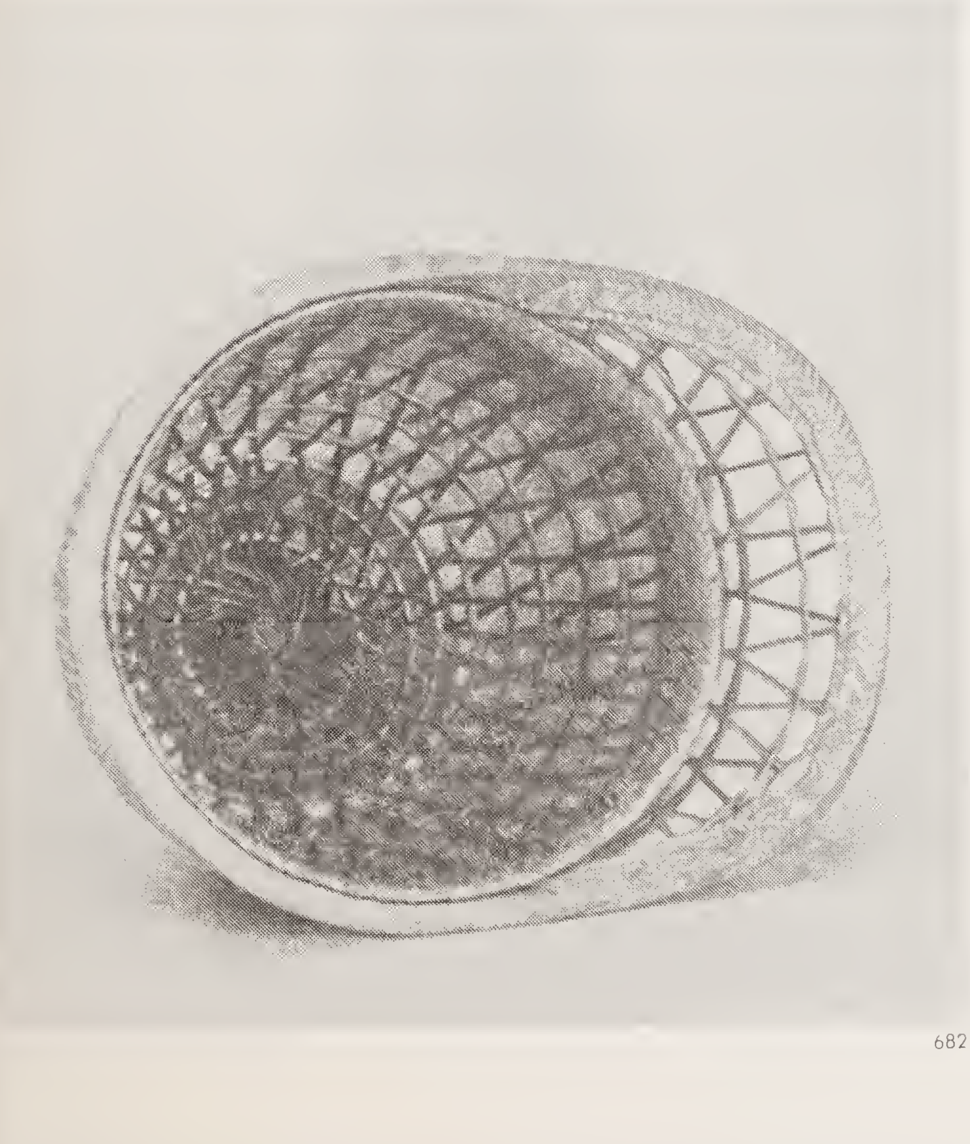
680: The coarsely woven inner layer is woven first.

681: A modern version of the *lukhum* has a plastic lining.

682: The inside view of this *lukhum*.



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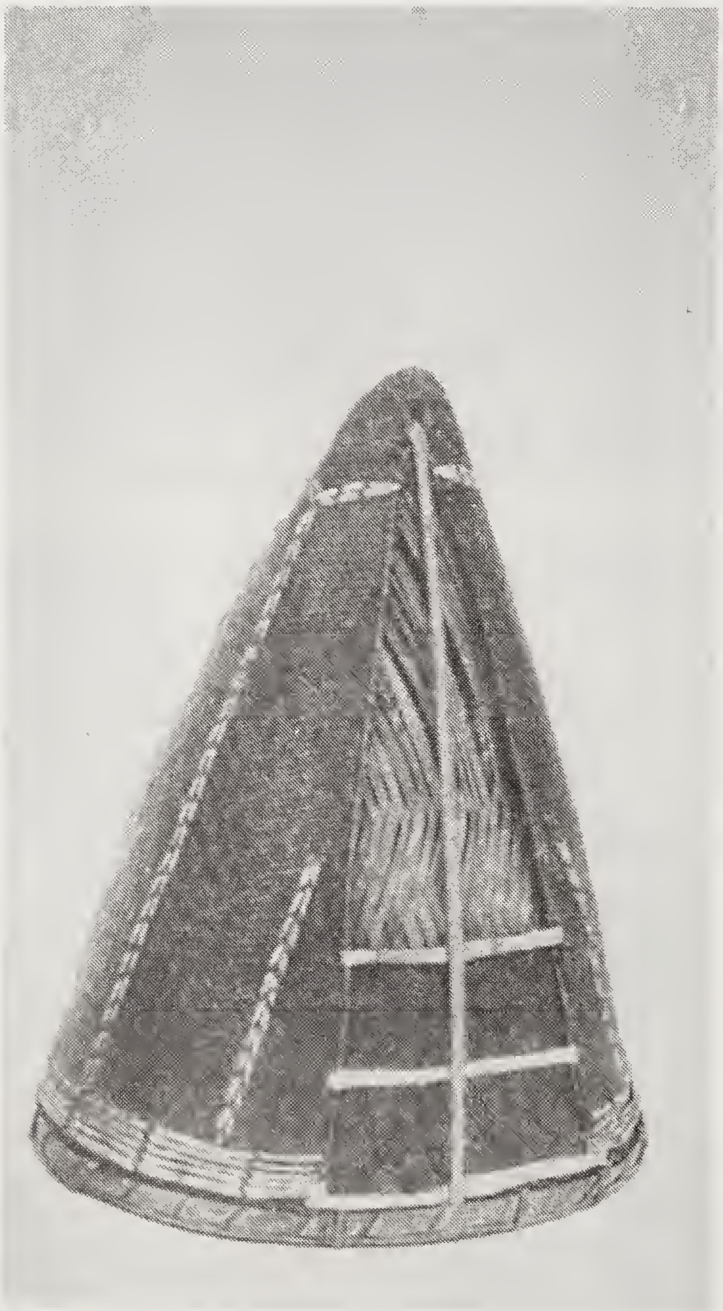

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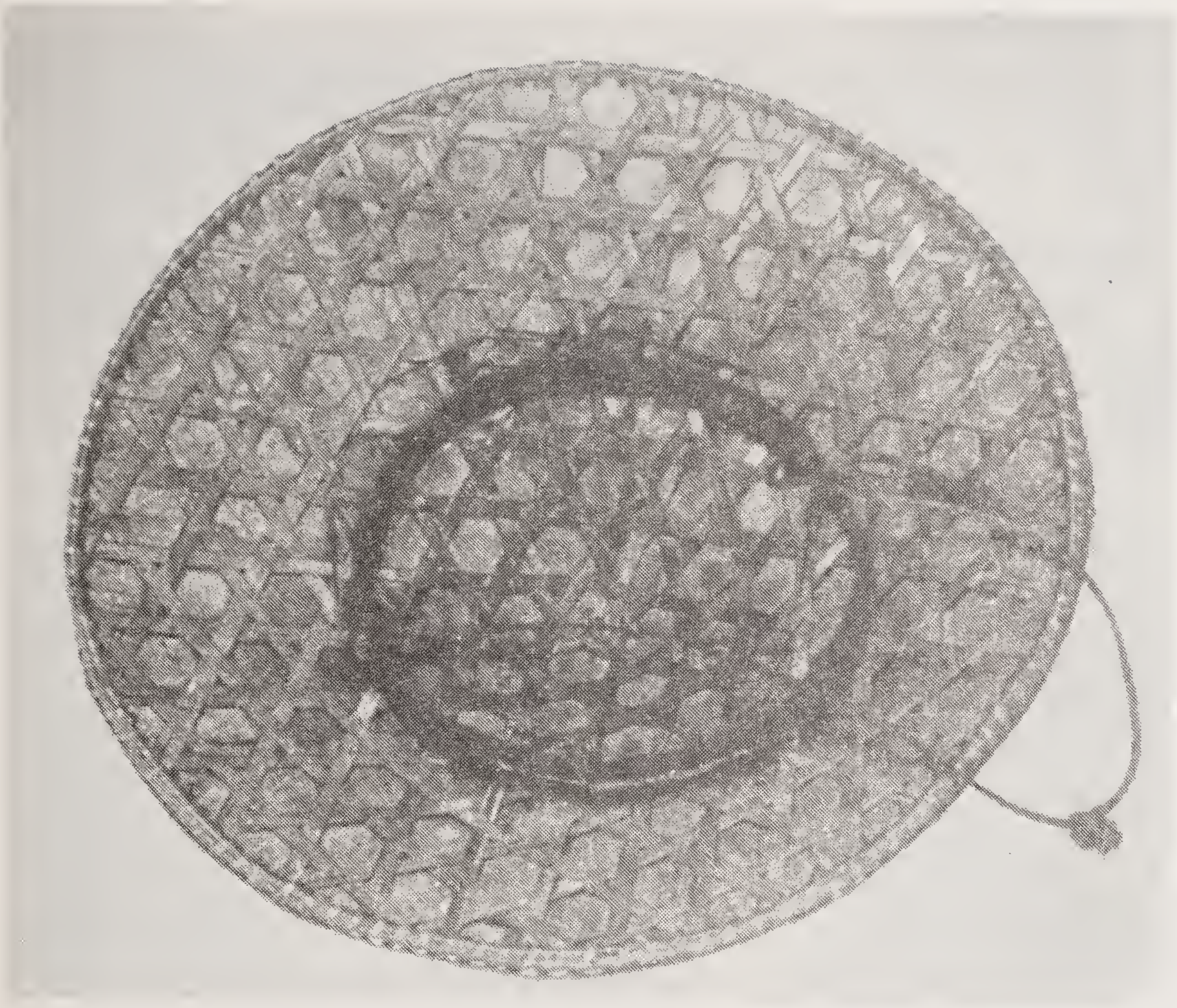
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683: A Monpa bamboo hat.

684: An inside view of the hat.

685: Detail of the rim binding.

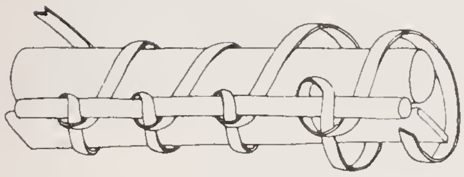
686: A schematic diagram showing the method of construction of the head band.

687: The Ao Naga ceremonial headgear.

688: The *khohom*, the Wancho ceremonial headgear.

689: A Nocte chief wearing the *khapok*, his ceremonial headgear.

690: Another type of ceremonial headgear worn by the Wancho.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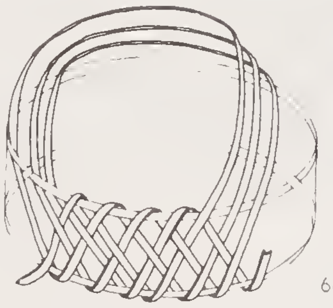
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Monpa Hat

The Monpas of Kameng District in Arunachal use a shallow conical hat to protect them from the sun and rain (fig. 683). The hat is made in two layers. The outer layer is woven in a close diagonal twill, while the inner layer is made in an open-hexagonal weave (fig. 684). A layer from the stem of a banana tree is dried and sandwiched between the layers to make the hat waterproof. The layers are held together around the edge which is sandwiched between two strips of cane, tightly bound together (fig. 685). A braided bamboo head-band (fig. 686) is fitted inside the hat, which is held on the head by a strap looped below the chin.

Ceremonial Headgear

The Ao Nagas use a decorative ceremonial hat which is very similar to those used by the Wancho and the Nocte tribes of Arunachal (figs. 687-690).

The cone-shaped hats are made in two layers, the inner layer which provides the structure and the outer layer which is mainly decorative. The outer layer is made from dyed strips of bamboo or cane, and decorated with yellow and black strips. The yellow strips may be bamboo or cane, but more often they are the skin of an orchid stem which turns a bright yellow when dry. The red and black dyeing of bamboo and cane using natural dyes is the most significant aspect of these hats. The process of dyeing differs slightly from tribe to tribe.

Coiled Hats

As mentioned earlier, coiling is a technique where lengths of cane are wound in a continuous close spiral to create surfaces or three-dimensional forms. This technique has been used to make containers and hats (figs. 691, 692).

Hat from Kohima

This is a contemporary coiled hat bought from the state emporium in Kohima, Nagaland (fig. 693). The body of the hat is a short oval cylinder with a flat top. A narrow horizontal rim extends around the body. The hat is made by coiling lengths of a round cane split.

The coiling is begun at the centre of the top surface, where the round cane is shaped into a flat split so that a tight coil can be made. This prevents the formation of a hole at the centre. The first few coils are held in place by large radial stitches made with a thin cane split. The hat is formed by coiling the round cane split and each coil is held to the previous one by close looped stitches made with the thin split. This results in staggered stitches, which form a pattern of inclined lines on the hat. When the length of the coiling cane has to be extended, the end of one piece is overlapped with the beginning of a new piece. The ends are cut in half at an incline so that the thickness of the coil does not increase at that point. This structure results in a fairly rigid and sturdy hat, and no additional strengthening elements are used.

691: A coiled cane hat seen at the museum at Along.

692: The *apotologri*, a popular hat used by the Idu tribe of Arunachal Pradesh, seen at the museum at Hopoli.

693: A coiled cane hat from Kohima.

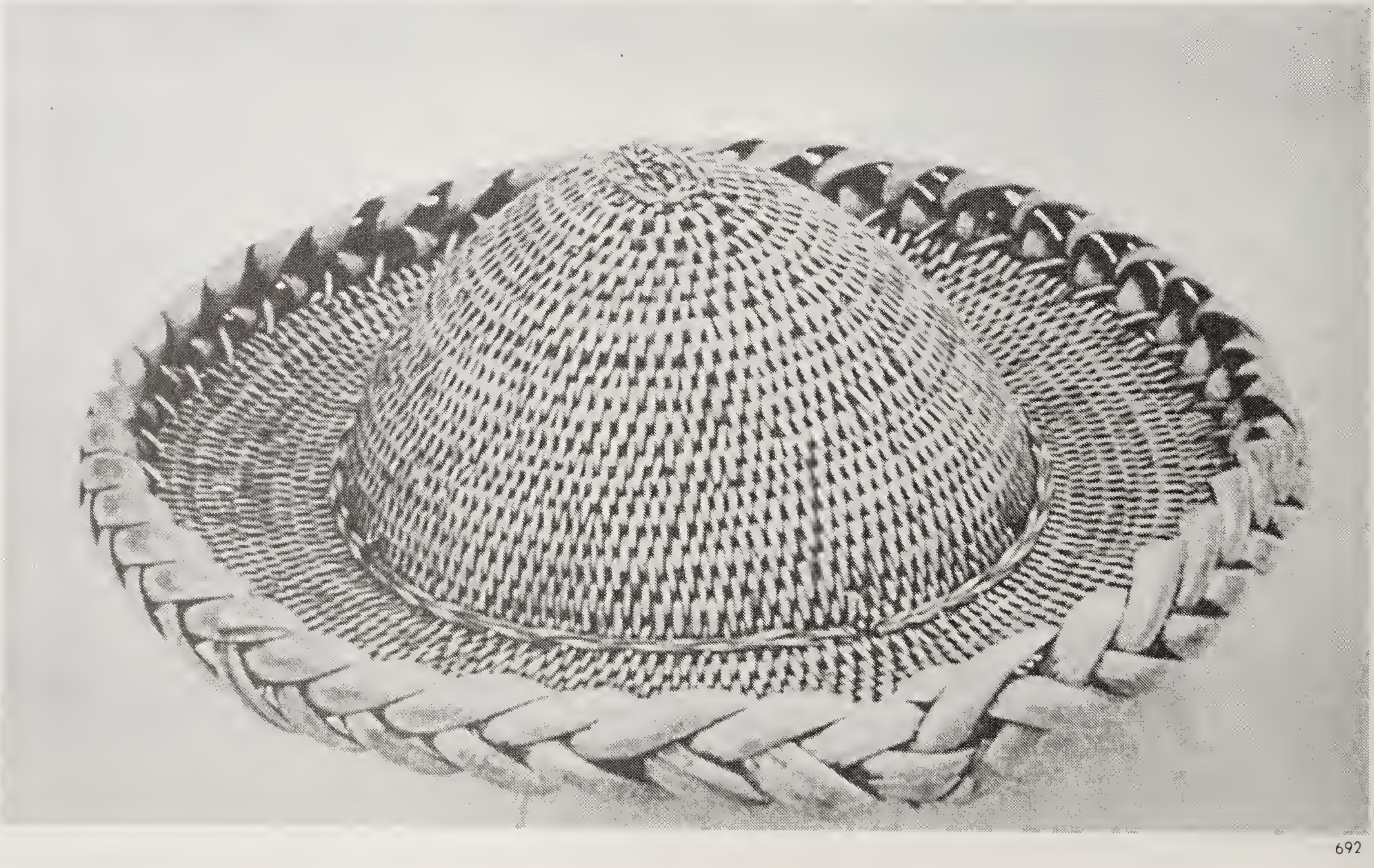
694: The *bopa*, used by the Apa Tani and Nishi tribes.

695: An Apa Tani man wearing a *bopa* while braiding a split-cane knee band.

696: A schematic diagram showing the construction of the tail of the *bopa*.

Bopa

The Apa Tani and Nishi tribes of Arunachal use coiled hats that fit close on the head like a skull cap (figs. 694, 695). The construction of this hat is identical to the one mentioned above. The *bopa* is slightly conical in shape, but at the back there is a fairly sharp tail-like structure that protrudes at an angle upwards. The hat is coiled into shape beginning at the top. Towards the base of the cap, one of the coils is extended outwards in a fold (fig. 696). The consecutive coils go round the base of the hat, including the



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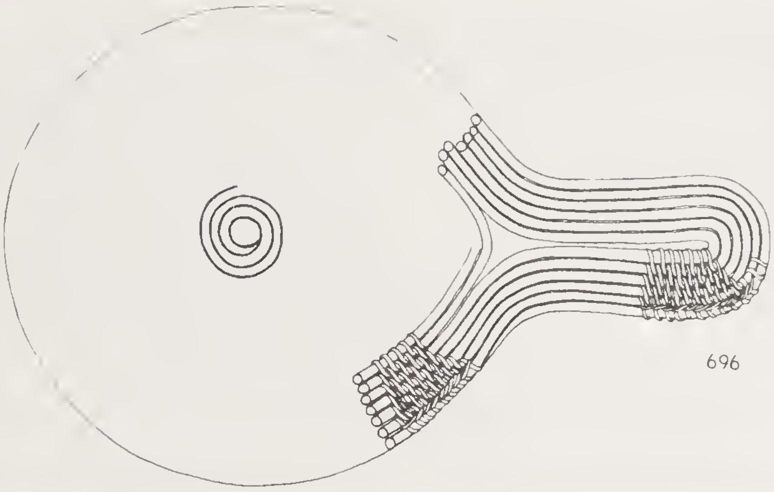

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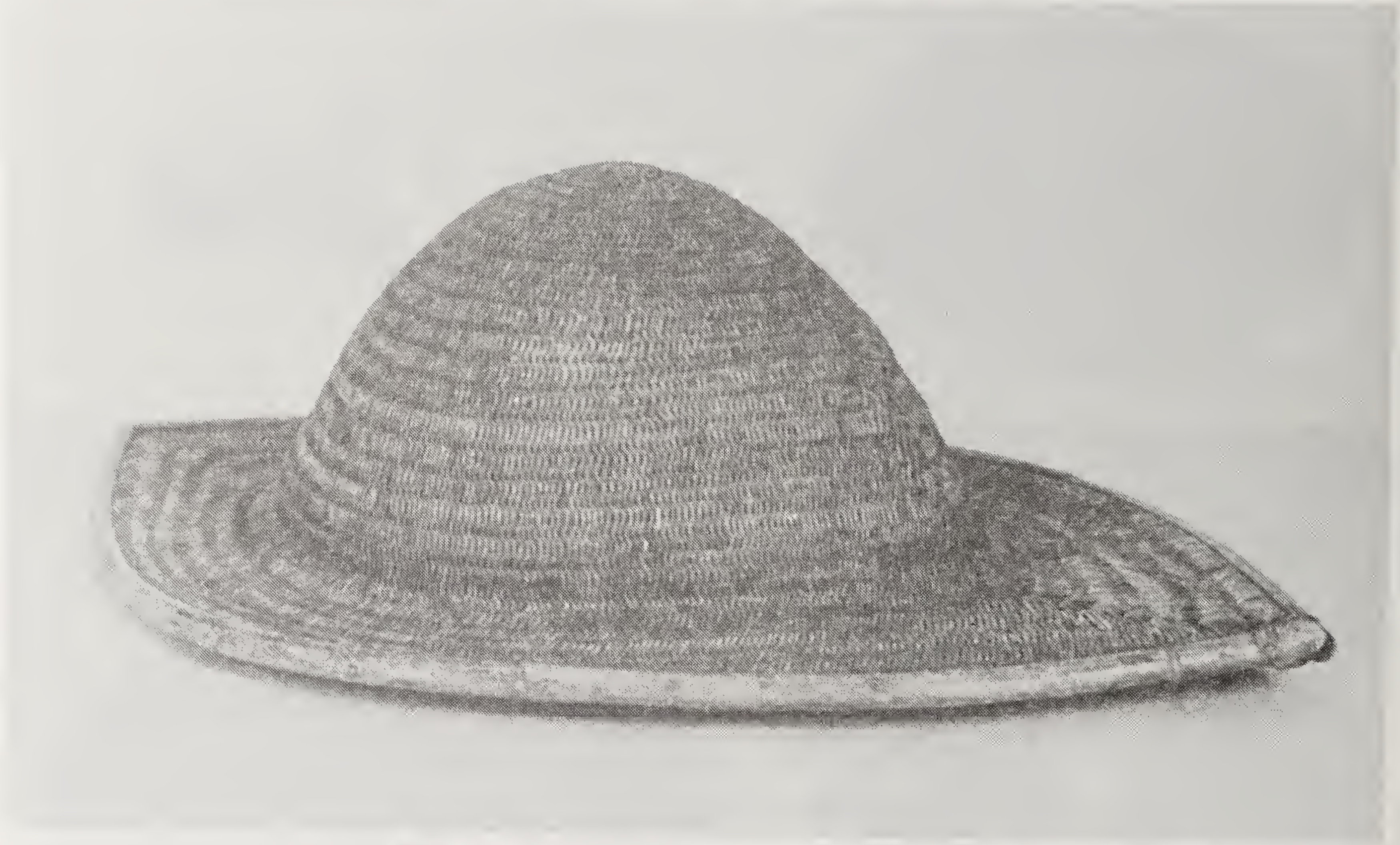
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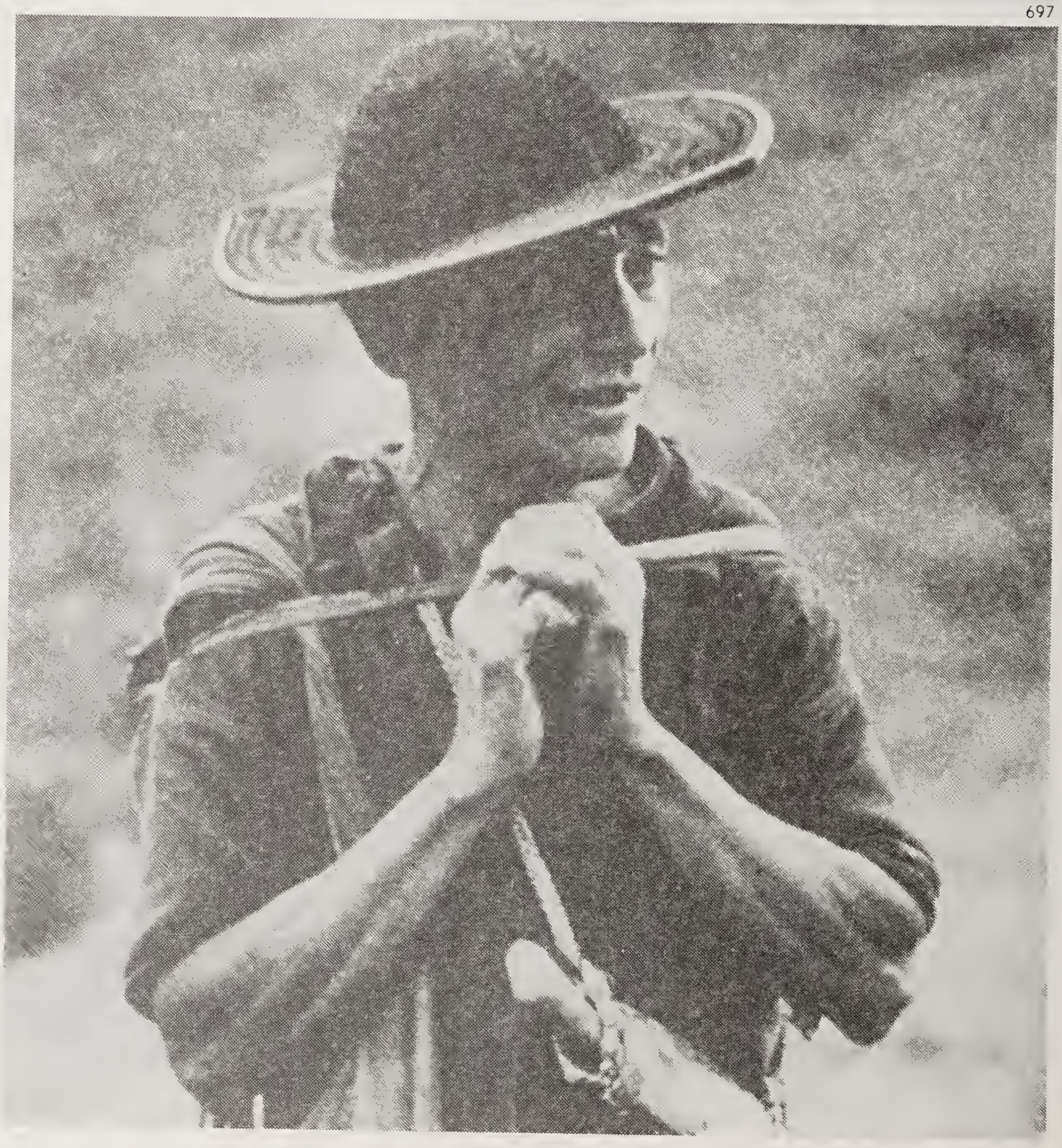
697: The *bolup*, an Adi Gallong hat.

698: An Adi Gallong man wearing a *bolup*.

699: A fine cane split is looped around consecutive coils of cane.

700: A cutaway view showing the half split of cane which sits over the rim.

701: The *dumlup*, an Adi Minyong hat seen at the museum at Hopoli.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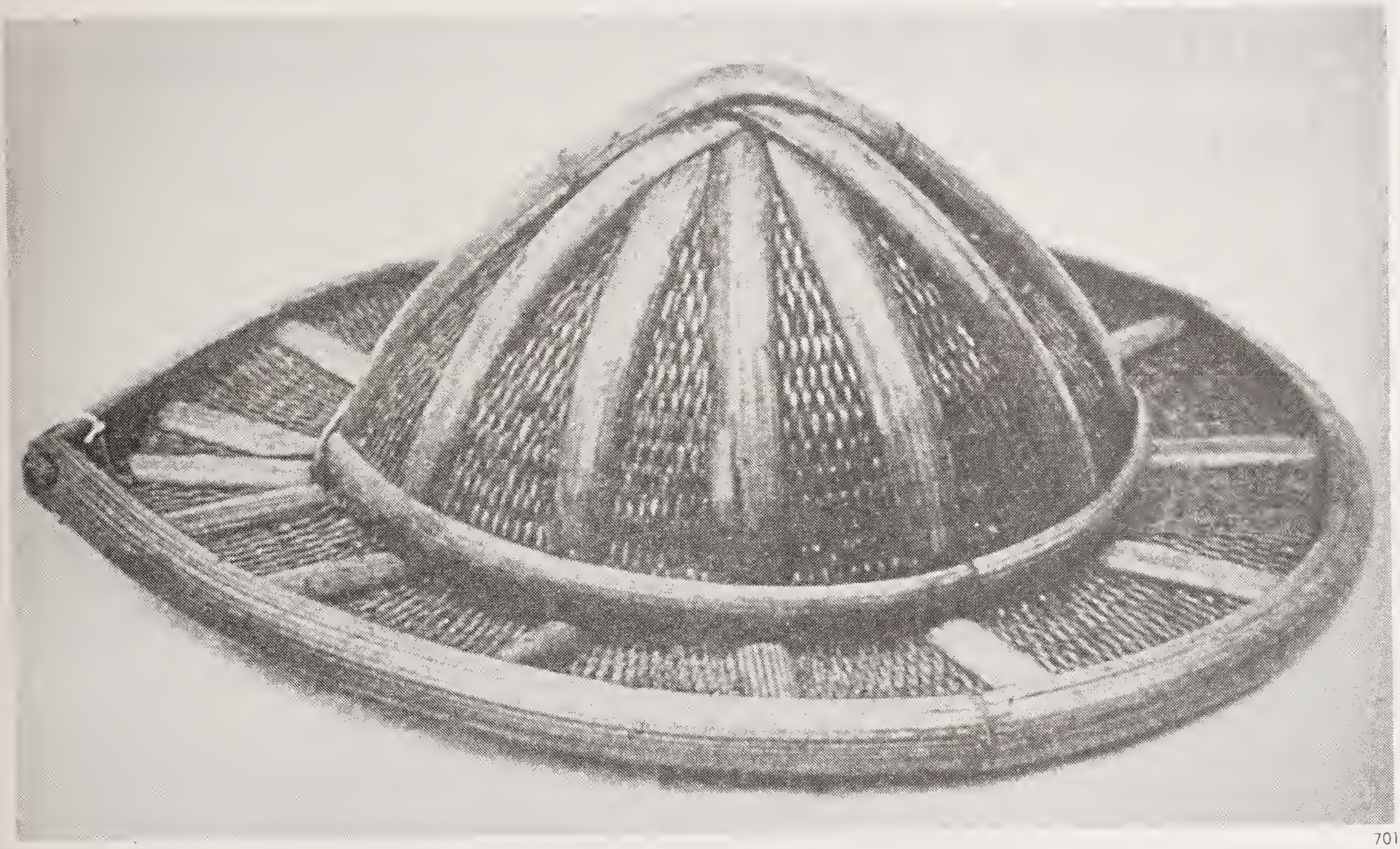
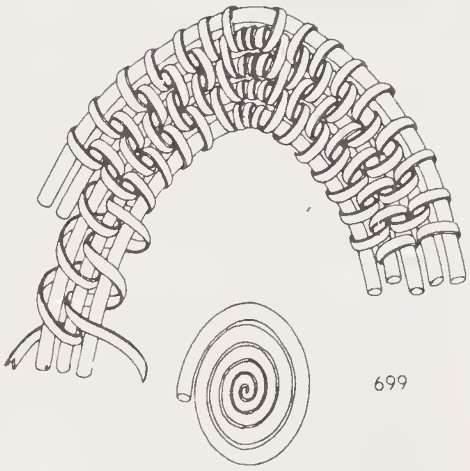


701

protruding fold in a smooth flow. The last coil is held in place by a neatly knotted stitch, and there is no additional strengthening element. These hats are decorated with twisted cane ropes, and a hornbill beak which is dyed red.

Bolup

The *bolup* is a hat used by the Adi Gallong tribe in Arunachal (figs. 697, 698). It is made by coiling lengths of cane to obtain a semi-elliptical bowl with a horizontal boat-shaped rim. To begin the coiling at the top, the first part of a length of cane is shaved flat, so that tight coils can be made. After this the cane is coiled in an elliptical form. This is done by shaping the cane so that it is thinner along the minor axis and thicker along the major axis, so that when coiled, an ellipse is automatically formed. Once the form is established, the thickness of the cane strip is made uniform. The rim is wider along the major axis on both sides of the bowl, where it extends into a sharp angle. This is done by slowly changing the curve of the edge of the bowl into an angle by adding extra pieces of cane along the major axis so that the rim grows faster than it does along the minor axis.



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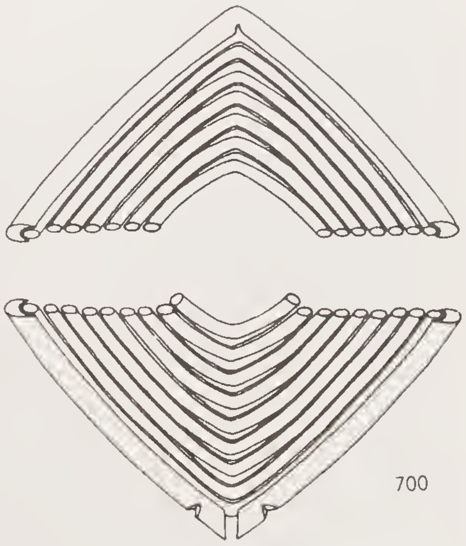
Consecutive coils of cane are held together by a fine cane split which is looped around them (fig. 699). The looping is done so that each row is alternately a left or right hand spiral. The direction of each row of loops is also changed along the line of the major axis. A half split of cane which has a groove on the inside is fitted over the rim, so that the last coil sits inside the groove (fig. 700). The ends of this cane meet at one of the angles of the rim and are held together by a fine cane split that passes through two holes in the cane. The cane is also tied on at a couple of other places on the rim, but it is mainly the tension of the cane, which is bow-shaped on either side of the major axis, that holds it in place.



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This hat is extremely sturdy. A similar construction is used in hats made by some other tribes in Arunachal. The form and decorative elements vary, but the basic structure is similar. In some cases there are thick strips of cane that are tied onto the hat as extra protection (fig. 701). In other hats, dyed wool or feathers are used as decorative elements.

Bamboo Mat Products

A number of handicraft products are fabricated out of bamboo mats where bamboo splits form the weft in a cotton or rayon warp. A number of small cottage industries in and around Agartala are engaged in the production of this type of bamboo matting as well as products made using this mat.

The fine bamboo splits that are used as the weft are obtained mainly from Nalchar village, where the Namasudra craftsmen, highly skilled in working with bamboo, prepare these splits (fig. 702). These craftsmen obtain their raw material, *paura* bamboo, free of cost from nearby groves. Only the internodes are used for the splits and the maximum length of split obtainable is dependent on the length of the internode. In this area it is difficult to obtain bamboo culms with internodes much longer than 600 mm.

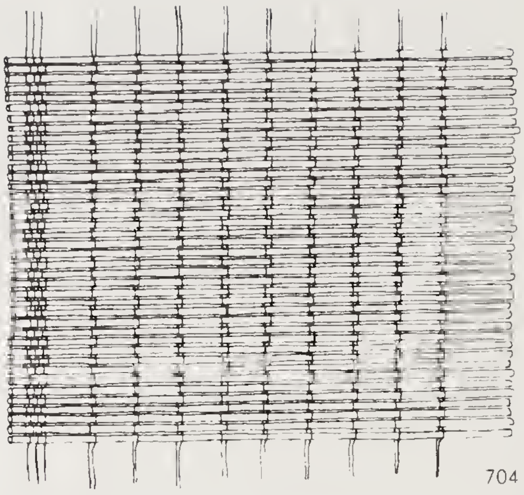
702

703

702: Women preparing fine bamboo splits at Nalchar village.

703: A craftsman working on a pit loom.

After the internodes have been cut to the required length, the culm is split first in half, then in quarter and eventually into very fine splits. The first splits, less than 0.5 mm thick, are made from the outer layers of bamboo. The inner layers of the culm are not used as they are relatively soft and fibrous. The splits are sold in bundles of 1,000, the price (1979-80) ranging from 50 paise to Rs. 2.00, depending on the quality and length of the splits. The width varies from less than 0.5 mm to 15 mm and the length from 300 mm to 600 mm. Fine splits are used as *agarbati* sticks, but the maximum demand comes from the mat weaving industry, which places orders for the sizes according to its requirements.



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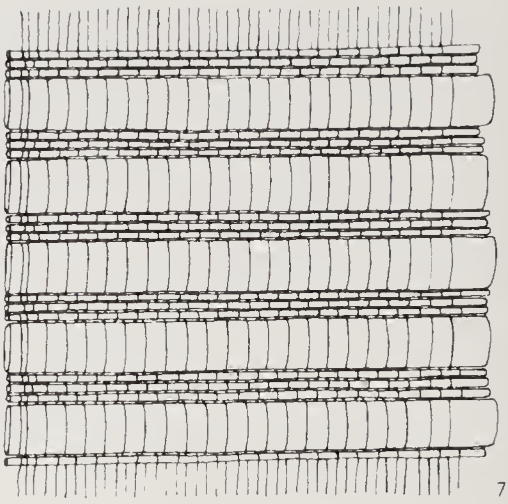

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Mat Weaving Industry

A typical mat-weaving cottage industry near Agartala is the Lakshmi Narayan Handicrafts, named after the proprietor. The craftsmen generally belong to the weaving community of Debnaths. There are about 20 pit looms in a large shed (fig. 703). The warp is generally made from rayon purchased from Calcutta and dyed locally. It is wound across nails on two posts that are part of the shed. The warp threads serve mainly to hold the bamboo strips together, without actually creating a surface with them as in woven cloth. Here the surface is created by the parallel strips of bamboo. It is not necessary therefore to have the warp evenly distributed across the width of the mat. The warp threads are generally arranged in pairs that are spaced about 10 mm apart (fig. 704). When wide bamboo splits are used, however, the weight of the splits requires a closer distribution of warp threads. Once the warp is fixed on the loom, the bamboo weft strips, which are first treated with insecticide, are woven into it in a simple tabby weave.

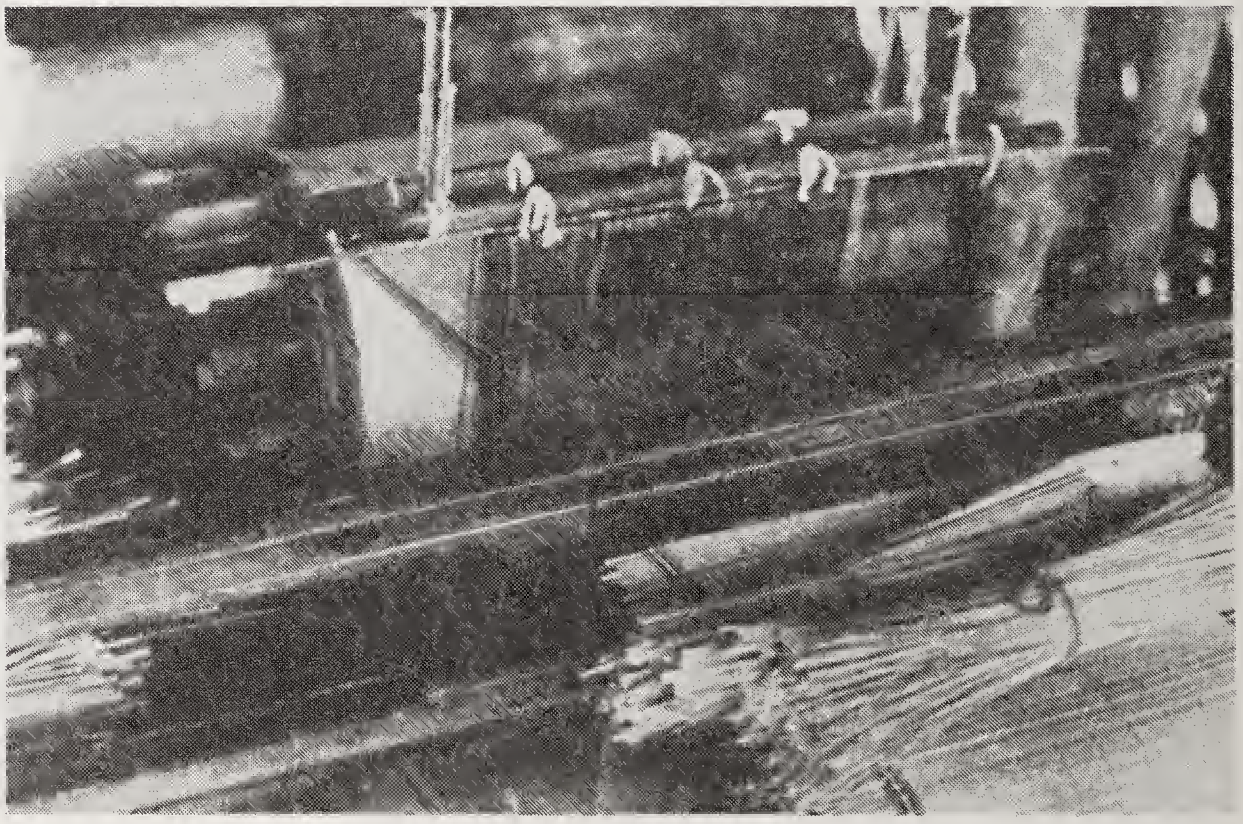
Weave Structure

As a rule these bamboo mats are flexible only in the direction of the warp as the weft consists of relatively rigid bamboo splits. The flexibility of the weft depends on the flexibility of the splits used. Some mats are woven with a combination of wide and narrow strips of bamboo, that creates a weft-striped surface (figs. 705, 706). Coloured or textured warp stripes are made by arranging the warp threads accordingly and sometimes the bamboo strips themselves are dyed.

704: The weave structure of the mat.

705: Different widths of bamboo strips are stored near the loom.

706: Weave structure of a mat with bamboo strips of different widths.



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Marketing

Bamboo matting may be sold by the metre or converted into products. The cost per metre of the matting depends on the fineness of bamboo splits, the width of the mat and the number and colour of warp threads used per 25 mm. A metre of fairly fine matting 150 mm wide with a white warp would cost about Rs. 7.00 while a similar matting 275 mm wide would cost Rs. 10.00.

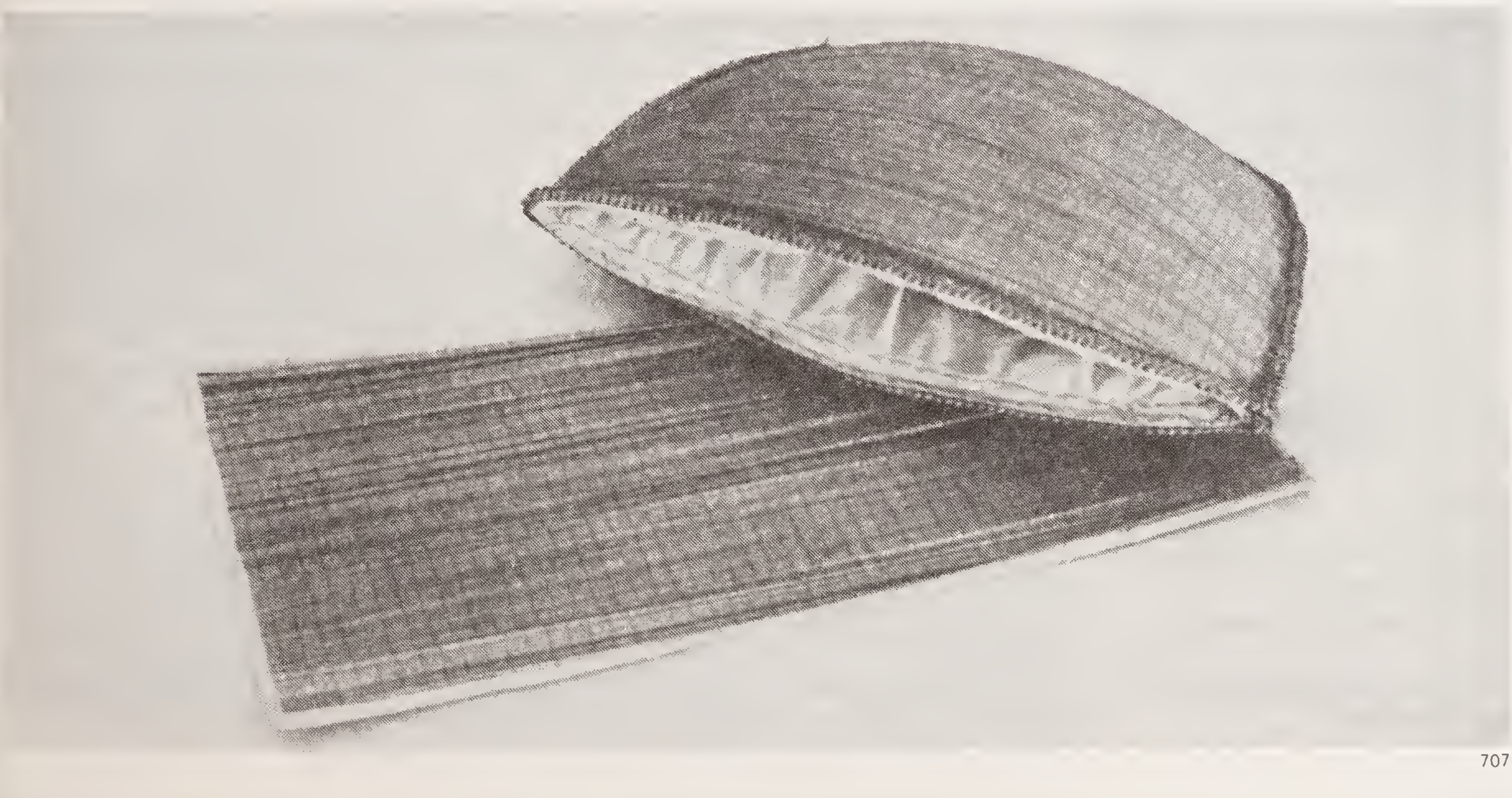
Products and By-products

A number of products such as fans, lampshades, handbags and various decorative items are made from converting bamboo matting. The simplest is a wall-hanging made from a 600 mm long mat, with a picture painted on it in oil colours by a local artist. The ends of the hanging are stiffened by bamboo splints. Another decorative product made from waste strips of matting are flower sticks. Narrow strips of matting which have warp threads along one side are used. The warp end is wrapped spirally around a core which is a bamboo stick, so that the free ends of the splits flare out to create a spiral flower pattern. Bamboo table-mats are one of the most popular products. These are woven on the loom in the required length and width. A set of table-mats consists of six mats of size 300 mm by 425 mm, one centre mat 300 mm by 800 mm and six tea mats 150 mm by 150 mm. One such set of fairly fine mats costs about Rs. 12.00 and a coarse set using wide strips of bamboo in the warp costs only Rs. 4.00. The weavers are paid Re. 1.00 per set of coarse mats. A skilled weaver would be able to produce 12 to 16 mats a day. Finer mats have a higher labour cost. Some sets of mats have decorative oil paintings executed by the local artist.

Tea Cosy and Tray Mat

A tea cosy and tray mat makes up another product (fig. 707). Made from very fine bamboo splits less than half a millimetre in width the tray mat is 300 mm by 500 mm, with the bamboo splits in the direction of the length. A cloth piping stitched all around the edges finishes the mat. A thick padded cotton tea-cosy is covered on the outside with the same matting to match the tray mat. The edges are piped with cloth and stitched onto the cotton tea-cosy. The opening and the periphery of the form is finished by tacking on a strip of bamboo braiding all around. The product could be fairly elegant, but the use of fevicol on the braided strip and the coarsely-finished construction considerably reduce its appeal.

707: A tea cosy and tray mat made from a fine bamboo matting.



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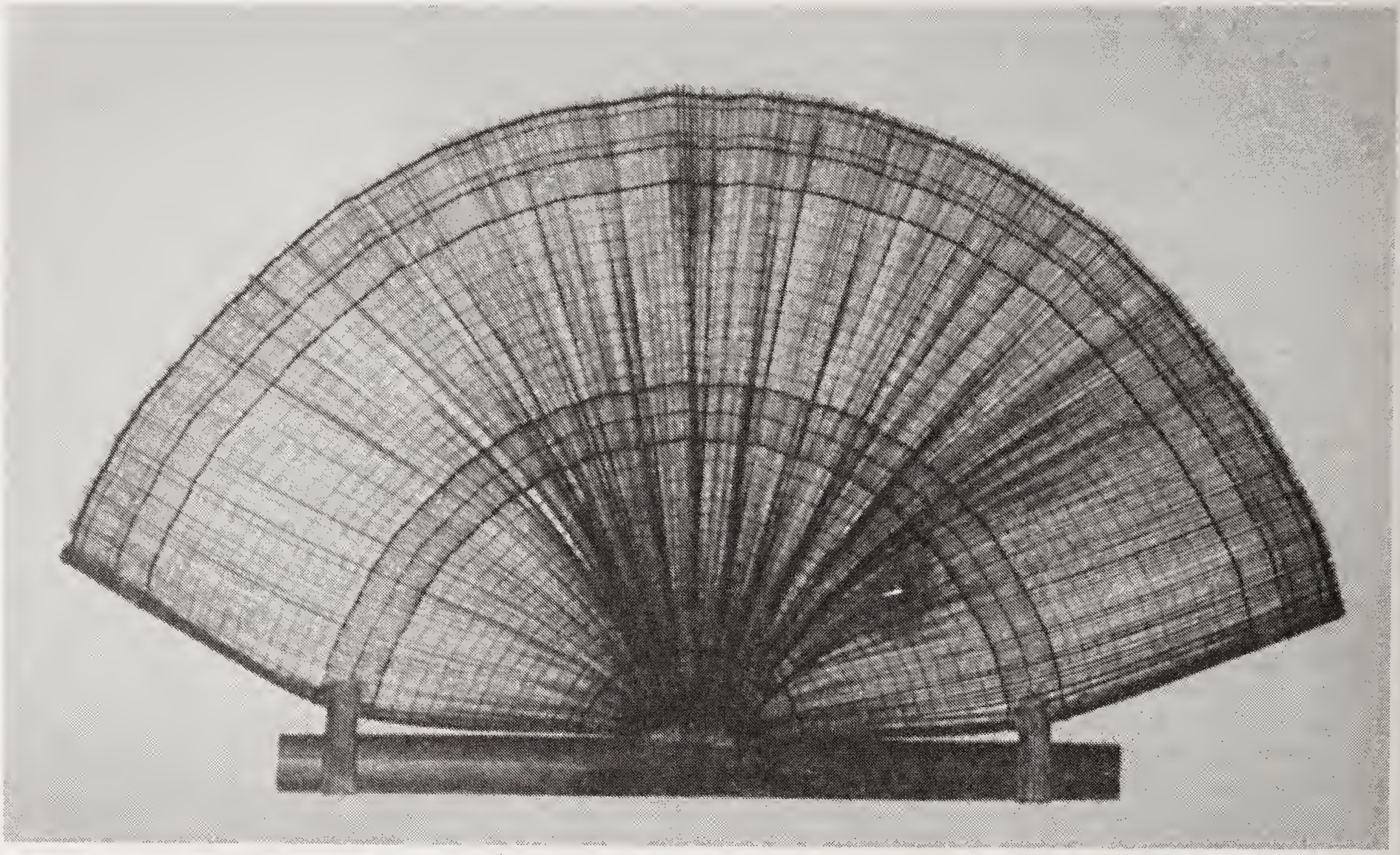

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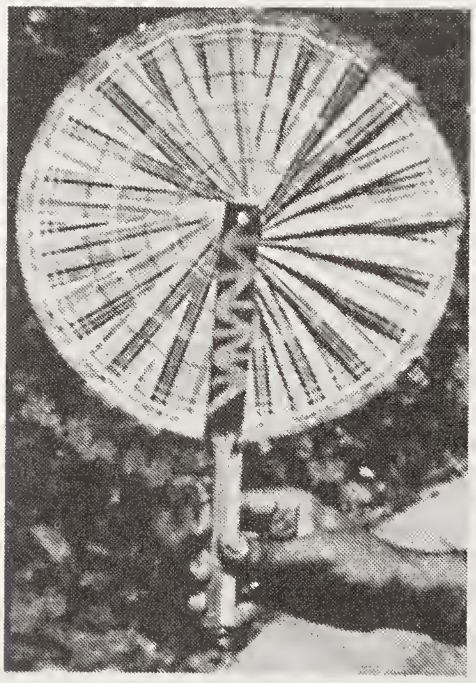

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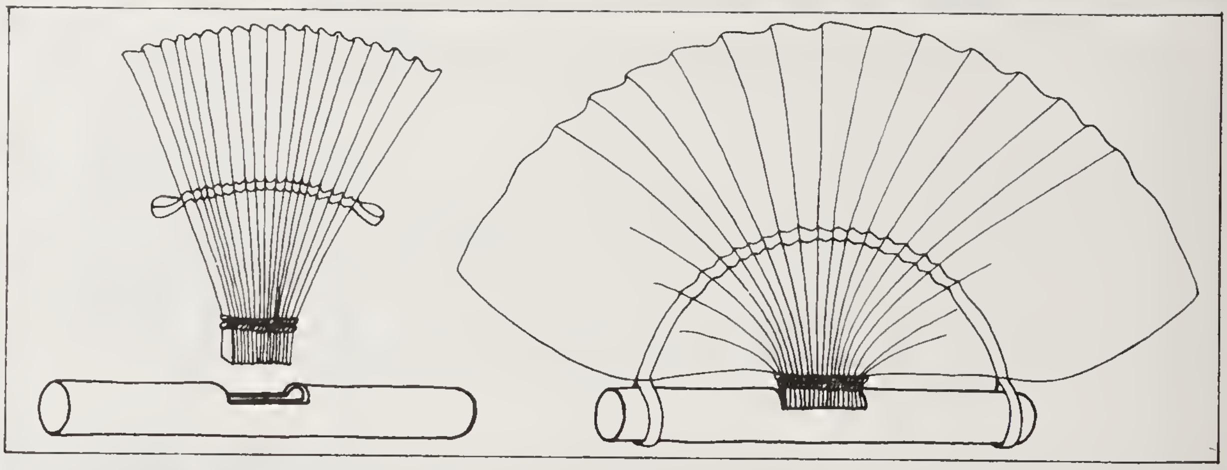

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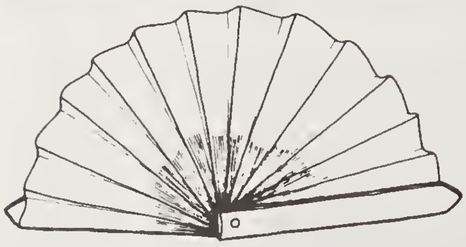

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708: A semi-circular folding fan.

709: A circular folding fan made in a similar construction.

710: The dismantling semi-circular fan.

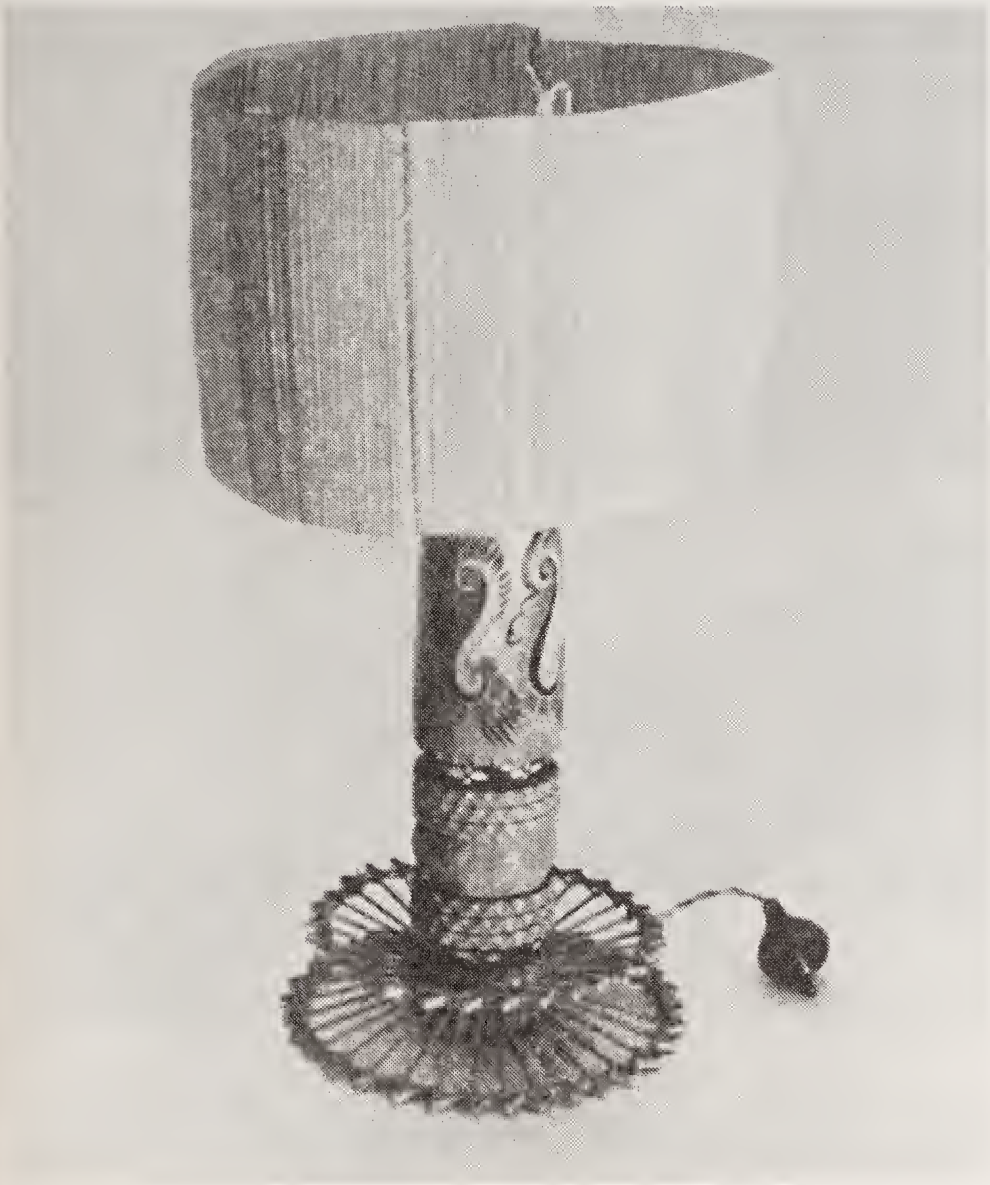
711: A diagram showing how the fan is assembled.

Folding Fans

Semi-circular and circular fans are made from bamboo matting using the unidirectional flexible quality of the mat. A length of matting of the required width is used. Two wide bamboo splints are stuck with fevicol along each edge of the mat, parallel to the weft and each splint is on either face of the mat. The mat is then pleated along the warp so that the width of the accordian pleats is the same as the width of the splints, while the mat lies in folds between the splints (fig. 708). At one end of the folded mat, a metal rivet, which acts as the pivot point, passes through and holds the splints and mat in position. When the fan is opened, the pleats open out creating a semi-circular fan.

A circular fan is made in a similar manner with the splints extending beyond the mat on the opposite side from the pivot, to form the handles (fig. 709). When each of these are opened through 180 degrees, the mat forms a complete circle with the pivot at the centre. The bamboo splint handles in both these fans have burnt decorations on them. This is done in a *batik* type of technique. Mud is plastered onto the splint in the desired pattern. The exposed portion of the splint is gently burnt with a blow lamp to produce a dark brown colour. The mud is removed to show the original colour of the bamboo and the desired pattern is produced.

One type of semi-circular fan can be dismantled (figs. 710, 711). An elastic band loop is stitched at each end of a length of mat at the centre of the edge. The mat is then pleated and one end is tightly bound with string. A slot is made in the centre of a piece of bamboo culm of diameter 15 mm. The bound end of the mat is fitted into the slot and the elastic loops are slid onto either end of the bamboo, holding the fan open. The bamboo also acts as a handle.



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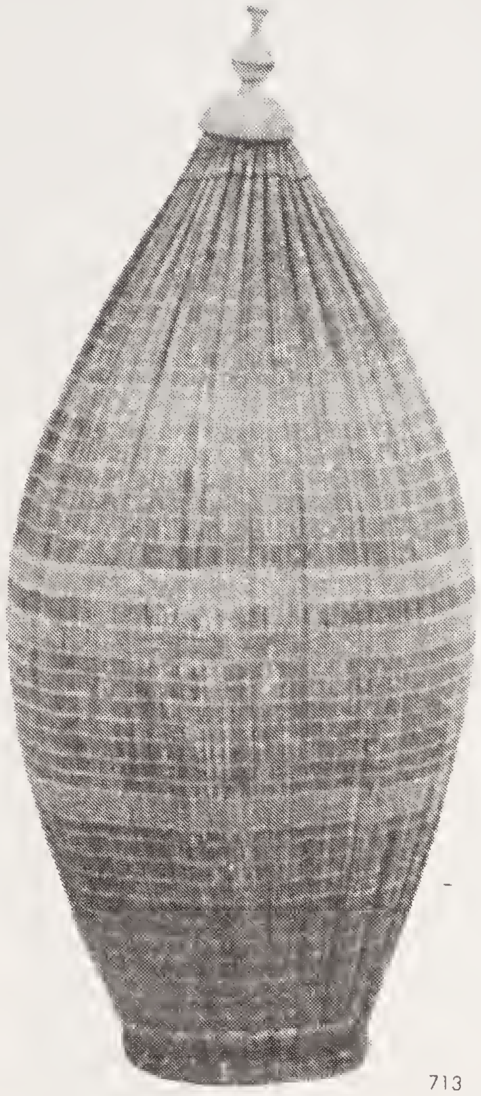

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712: A simple mat lampshade on a bamboo lamp stand.

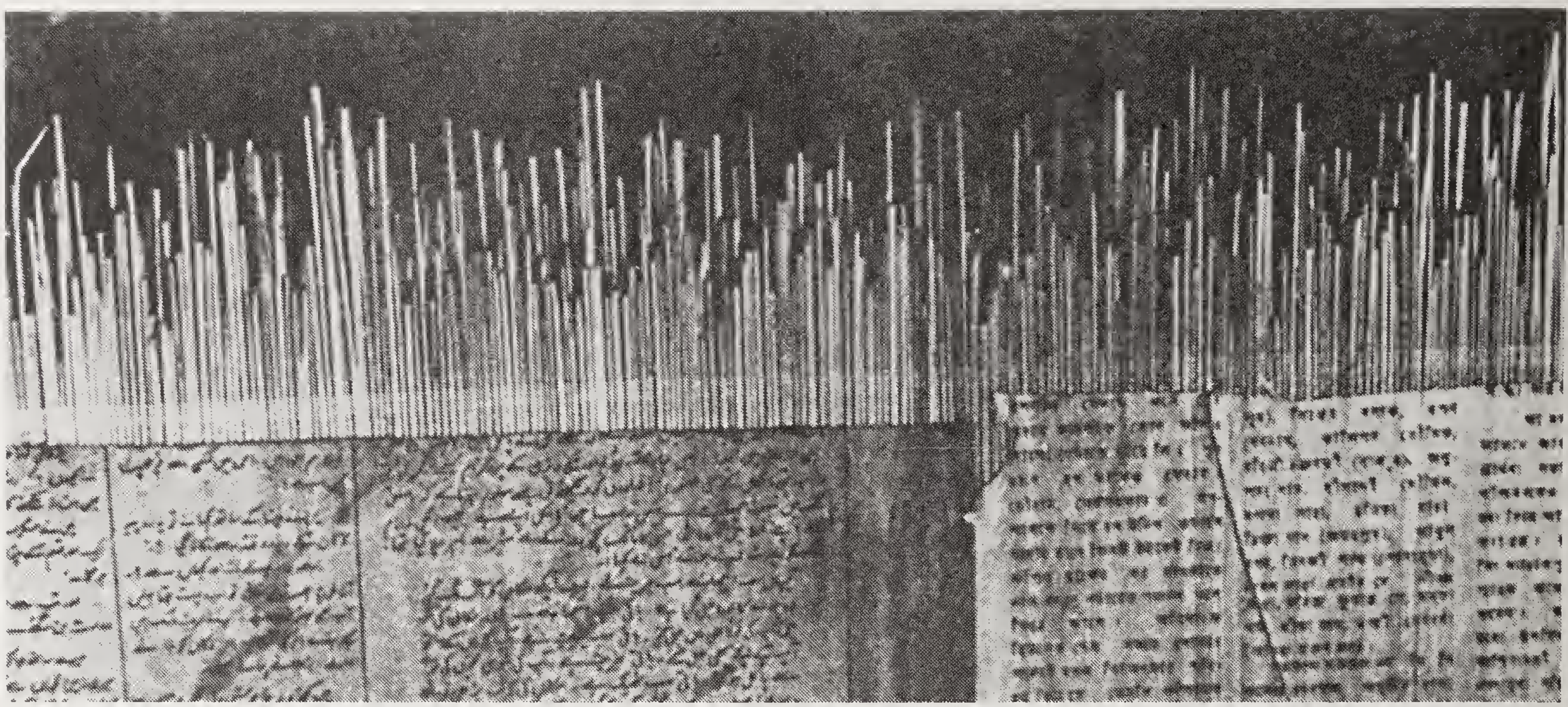
713: A rocket-shaped lampshade.

Lampshades

Lampshades are also made from bamboo matting. The idea is a good one, as the texture of the mat is accentuated when it is seen against the light. However, the samples seen were very crudely made without much attention to detail.

A simple cylindrical lampshade is made by joining the ends of a length of mat to form a cylindrical sleeve with the bamboo strips running along the height of the cylinder (fig. 712). A single circular ring of bamboo is put in the sleeve. The diameter of the ring is crucial as it must be the right size to hold the sleeve open under tension.

A variation of this is what is locally called the "rocket" lampshade, which describes its form (fig. 713). Instead of forming a cylinder open at the top and bottom, here the base of the cylinder is gathered slightly and sandwiched between two bamboo rings. The diameter of the rings is enough to allow a light bulb to pass through comfortably. The top edge of this cylinder is gathered to a point and capped with a conical piece of turned wood. The matting is held open at the centre of the sleeve by a circular ring of bamboo so that the diameter at this point is greater than the base diameter. Unlike the case of the cylindrical lampshade, the circular ring, once fitted inside the lampshade, cannot be removed. Its orientation however can be changed to lie parallel to the axis, thus flattening the lamp shade, when it is not in use.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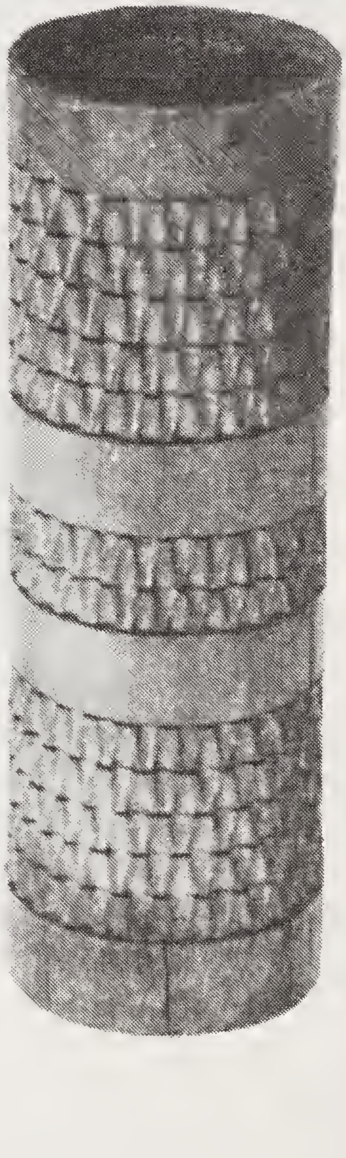
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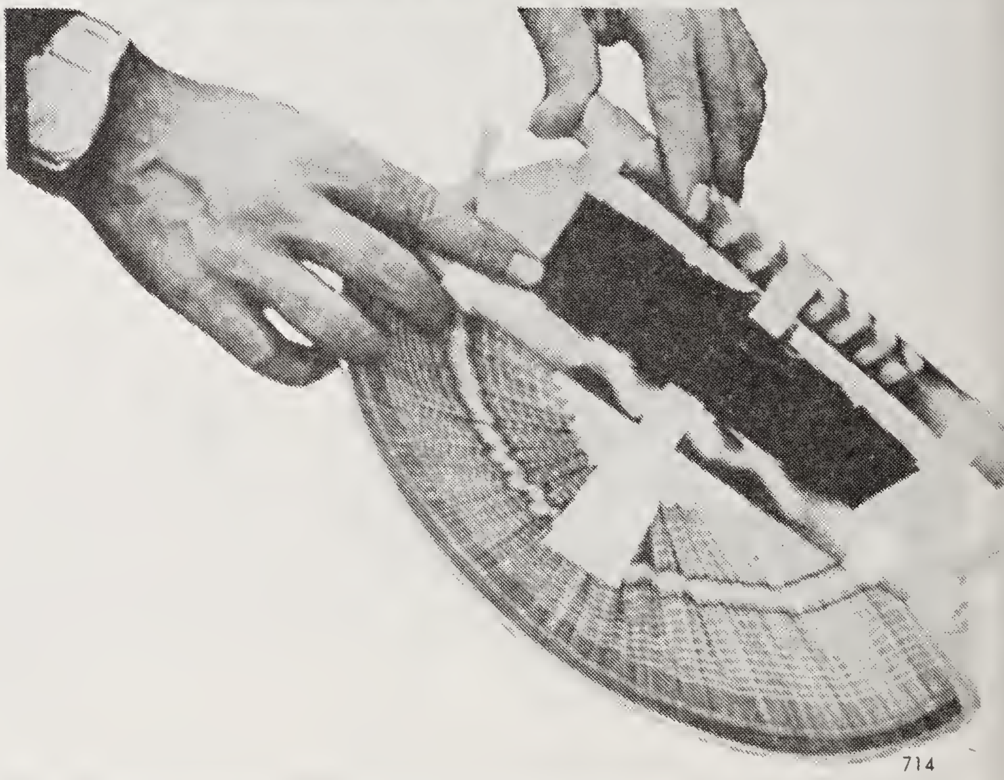
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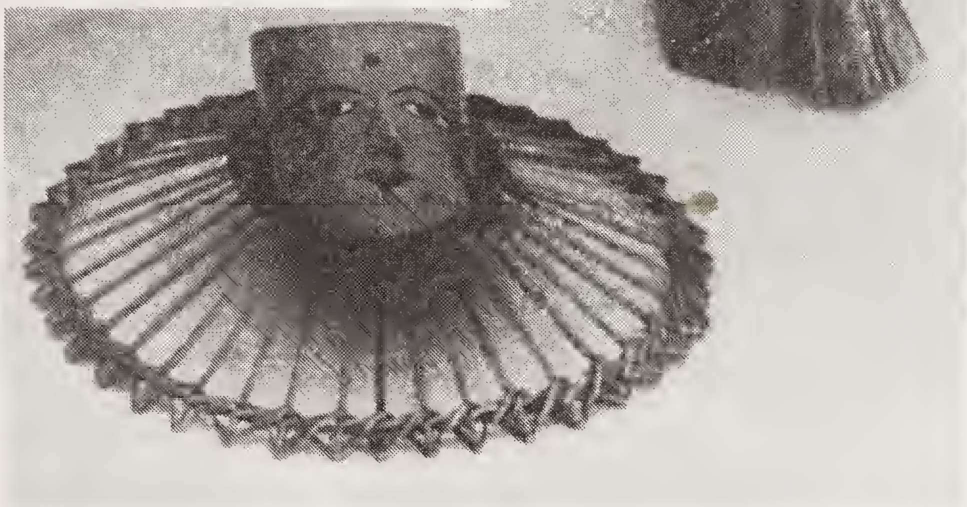

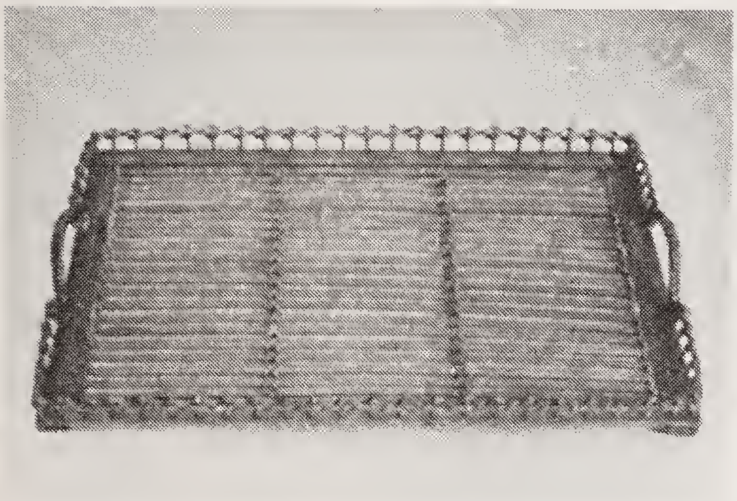

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Handbags

Handbags of various shapes and sizes are made from bamboo matting (fig. 714). These generally have stiff sides with rigid construction. A long length of matting is stuck onto paper or cardboard, using a flour paste (fig. 715). The components for a bag are cut out of the stiffened bamboo matting and a cloth lining is stuck onto the other side of the paper. The components are then stitched together with cloth or rexine gussets on a sewing machine. The edges are finished with a cloth or rexine piping. Straight handles are made from bamboo splints with burnt patterns on them.

A cylindrical drum-shaped bag was interesting. The sides of the drum and the cylindrical width were made from stiffened bamboo matting held together by cane binding. A part of the cylindrical surface was cut and hinged to provide the opening and lid. The hinge and fastenings were made of cane and the shoulder strap of the bag was a very supple cane braidng.

Most of the matting in all these products is attractive in itself and has a lot of potential. The crude construction and coarse finishing detracts from the beauty of the mat and results in second-class products.

Other Tripura Handicrafts

In addition to products made from woven bamboo mats several other products are made at Agartala. These include turned bamboo vases and lamp stands, carved and shaped containers such as mugs and pencil holders as well as a host of other novelty items fabricated from shaped bamboo splints. The main emphasis here is on fabricating decorative products meant for sale in upcountry markets through various handicrafts emporia (figs. 716-720).

714: A handbag fabricated from bamboo mats.

715: The mat is stuck on to paper to make it stiffer.

716: (A) A pencil holder and a wall decoration, typical handicraft products. (B) A decorative hair-clip.

717: A carved flower vase.

718: Folding fruit bowls made from bamboo.

719: A flower vase and flowers made from bamboo.

720: A tea tray with a decorative border and handles.

Miscellaneous Products

A host of small products are made from bamboo. These include toys, hand-fans, spoons, smoking pipes, musical instruments, combs and brooms. In addition, several accessories and tools used in weaving, weapons such as bows and arrows and weapon accessories such as a scabbard for the *dao* and tool handles are also made from bamboo. The range of products seems to be limitless, dependent only on the creative imagination and need of the craftsman who is able to generate such diversity in this abundantly available raw material.

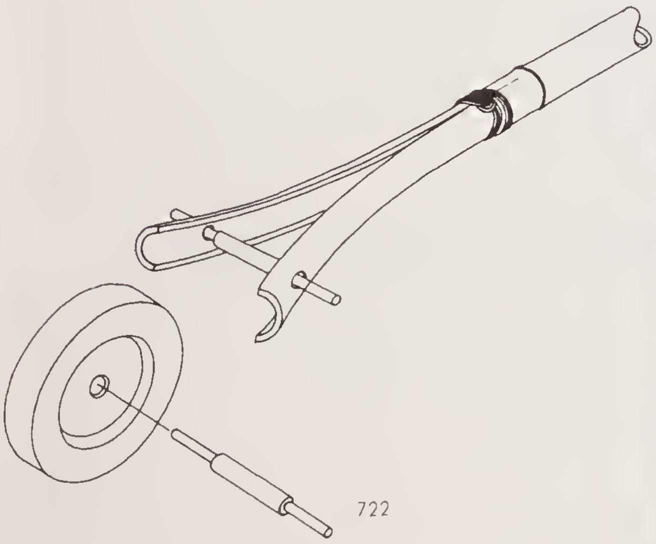
Toys

Wheeled Toy from Nalbari

An interesting wheeled push-along toy is made in Nalbari and used by the local children for active play (figs. 721, 722). One can see a group of young children running down a lane, pushing these wheeled sticks in front of them. The entire product is made from bamboo. The handle is a length of small-diameter whole bamboo, split longitudinally at one end. The split ends are spread apart to form a fork while a small split-bamboo strut holds the fork apart. The wheel is shaped from a node of a large bamboo and a hole in the centre of the diaphragm receives the strut, which is shaped to permit free movement of the wheel. The sample that was acquired lacks refinement; however, it is an interesting example of an indigenous toy.

721: A simple wheeled push-along toy from Nalbari.

722: A diagram showing the construction of the toy.



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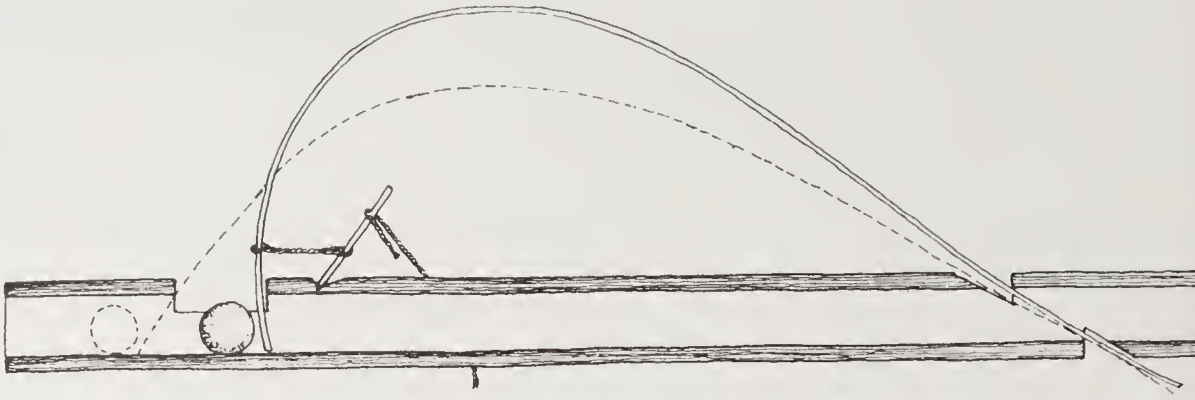
721

Bamboo Pop-Gun from Tripura, Mizoram

The bamboo pop-gun is an interesting toy made for children by local craftsmen of Tripura, Assam and Mizoram (fig. 723). A length of small-diameter bamboo is used as the barrel and a thick split is anchored at one end of this, while the other end is bent to rest in a slot in the middle of the



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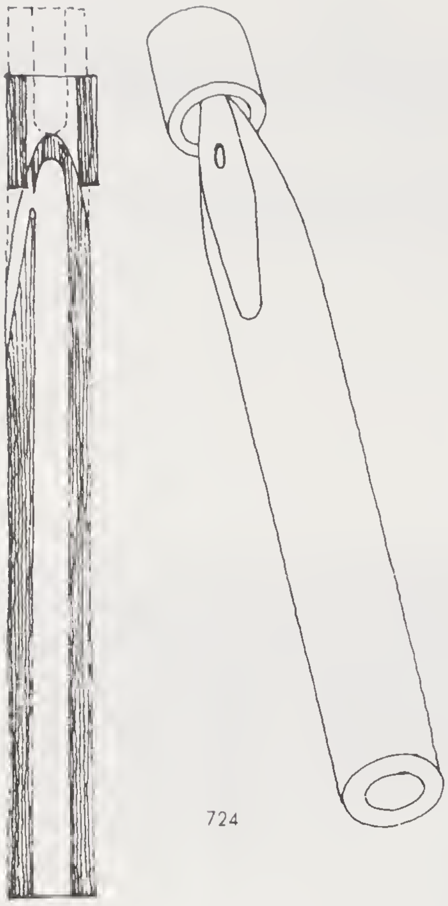

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723: A bamboo pop gun made for local children by the craftsmen of Tripura and Mizoram.

724: Sectional and external view of a bamboo whistle from Tripura.

725: A bamboo whistle from Silchar.

726: Simple bamboo flutes found in the plains of Assam, Tripura and Manipur.

tube. When the split is pulled back in the slot and released it can propel a small pellet placed inside the tube. An ingenious trigger mechanism is provided to regulate the release of the pellet.

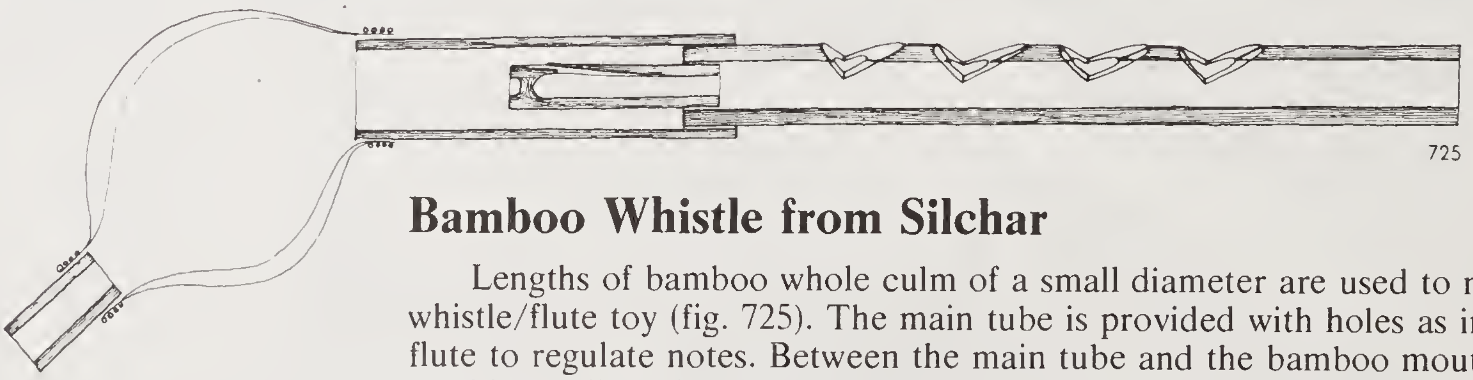
These devices seem to have evolved from the innumerable bird and animal traps that are used locally. Most of these traps use the elastic property of bamboo splints in order to spring the trap when the prey touches the trigger.

Woven Animal Forms

In Agartala a few craftsmen prepare small woven animal forms from fine splits of bamboo. These are intended both as toys and as decorations. The forms are evolved either by weaving or braiding uniformally fine splits.

Bamboo Whistle from Tripura

Tiny bamboo whistles are made from small-diameter culm lengths (fig. 724). The main tube has a node at one end which is tapered to form a cone before a small hole is pierced near that node. A mouth-piece using a short length of whole culm is wedged over the conical end leaving a small gap for air to pass over the hole in the main tube. The whistle gives off a shrill sound when blown. This whistle was seen at Gaurangatilla in Tripura.



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Bamboo Whistle from Silchar

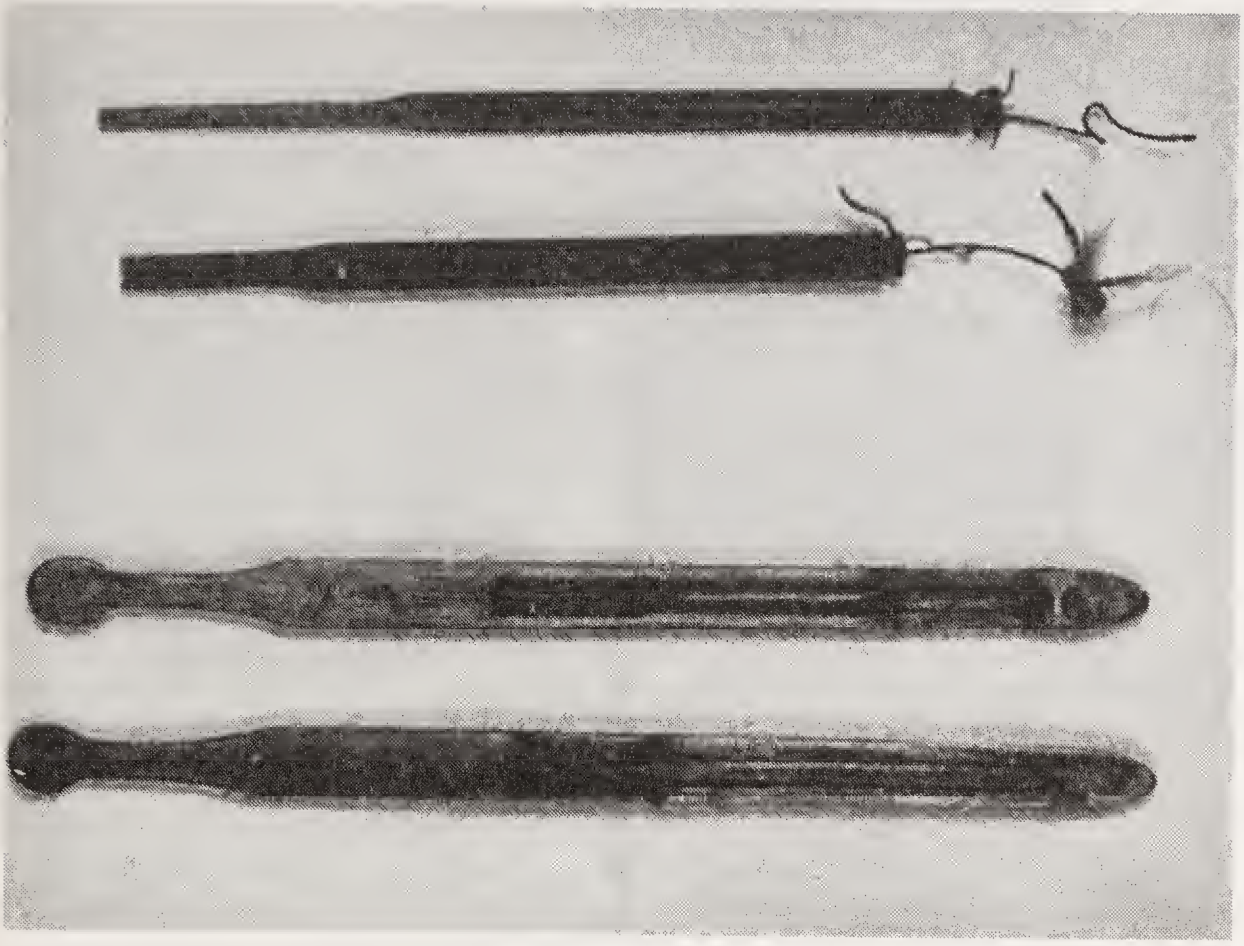
Lengths of bamboo whole culm of a small diameter are used to make a whistle/flute toy (fig. 725). The main tube is provided with holes as in a flute to regulate notes. Between the main tube and the bamboo mouth-piece a rubber balloon is attached by binding the open ends with cotton thread. This makes the product colourful and results in an effect similar to a bag-pipe. These are sold in bazaars and *melas* in the plains of Assam.

726

Musical Instruments

Bamboo Flutes

Several types of bamboo flutes are made in the plains of Assam, Tripura and Manipur (fig. 726). These are sold at shops in several towns in these states. Some of these flutes are toys while others are made for professional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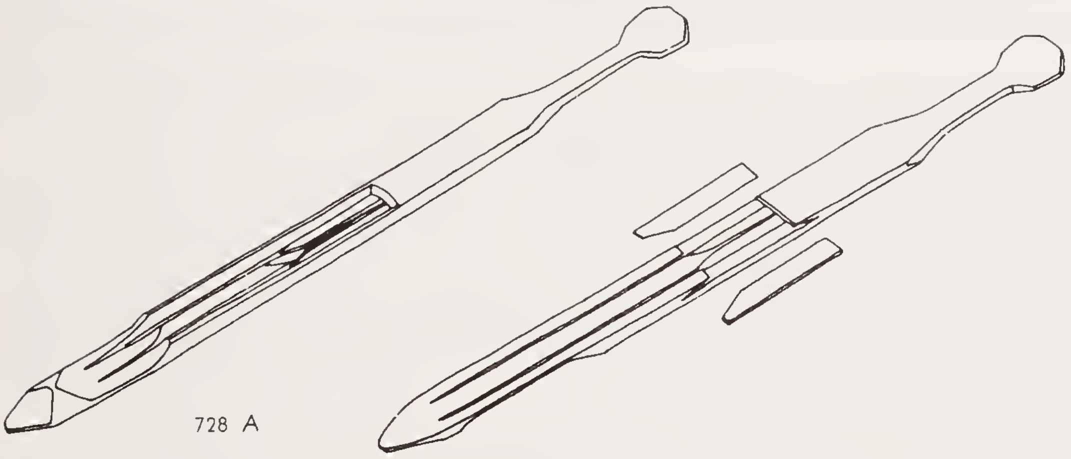
727: The top and bottom views of (top) the *gungura* from Nagaland, and (bottom) the *gungura* from Assam.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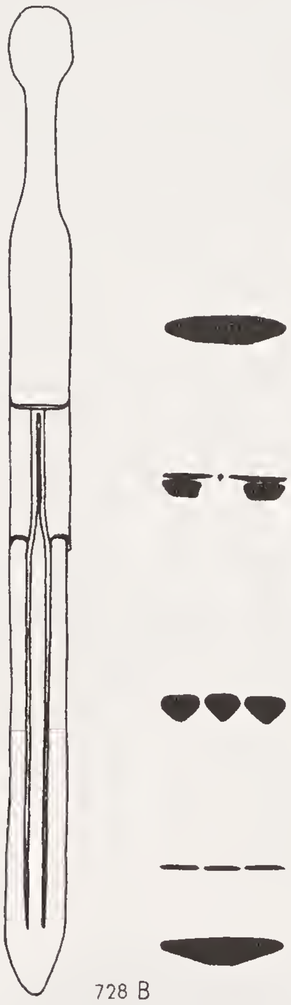

728 B

728: (A) The construction of the *gungura* from Assam. (B) The diagram on the right shows the cross section at different points.

musicians. They are made from a length of whole culm of a fairly small diameter and wall thickness. The holes on the culm wall are made by burning with a hot metal poker. The upper end of the flute is blocked either by an existing node or with a layer of resin. Some of these flutes are decorated with coloured bands and the surface is coated with a layer of lacquer.

Gungura

The *gungura* is an interesting bamboo musical instrument made and used by the Assamese (figs. 727, 728). It is similar in function to the "jew's-harp". The *gungura* is shaped from a thick bamboo outer splint so that one end forms the handle while the other end can be struck by the fingers when the instrument is held against the mouth. The vibrating reed is shaped from the same piece and is connected to the end that is struck. The split is selectively carved to get the desired notes as the carving at certain parts influences the vibration of the reed. Two thin splits are added to the main body on either side of the narrow reed in order to regulate the gap at this point.

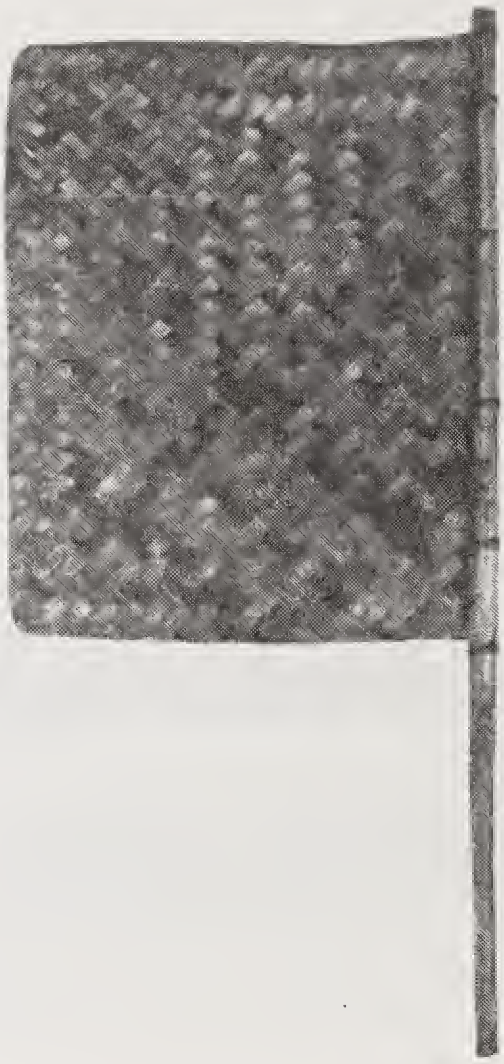
A similar musical instrument is made by the Chang Nagas of Tuensang village. These instruments are similar in structure to the *gungura*. The left hand end forms the handles while at the other end a length of twisted fibre rope is firmly anchored. The reed is vibrated by pulling at the rope which is held stretched by the other hand.

729: A hand fan from Assam.

730: A rotatable hand fan from Assam.

731: A Dimasa Cachari hand fan.

732: Detail of the rotating handle assembly.



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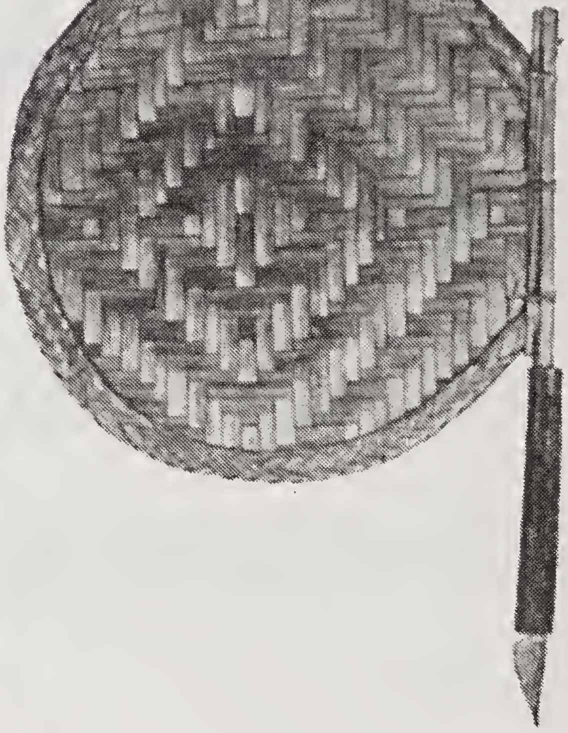

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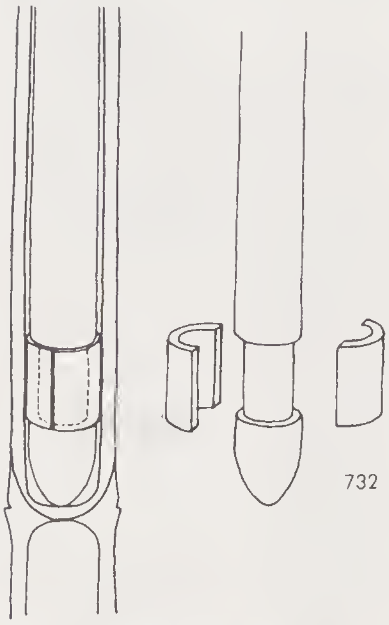

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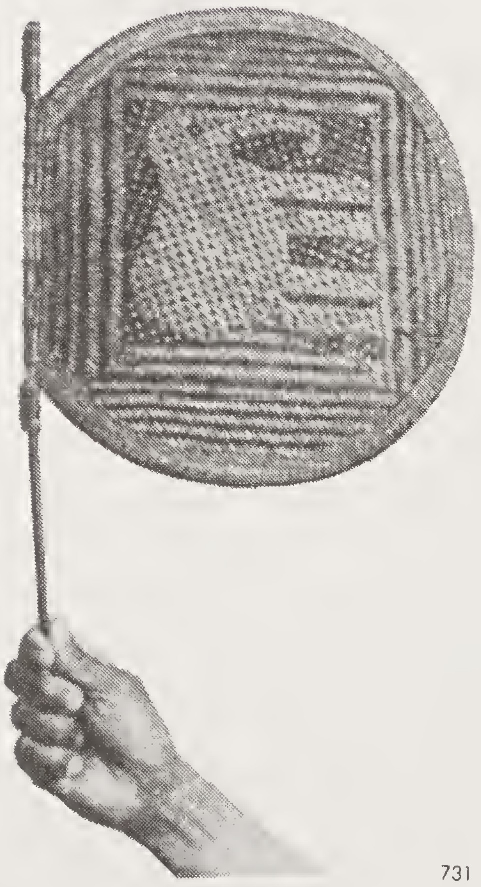


731

Domestic Products

Hand Fan from Assam

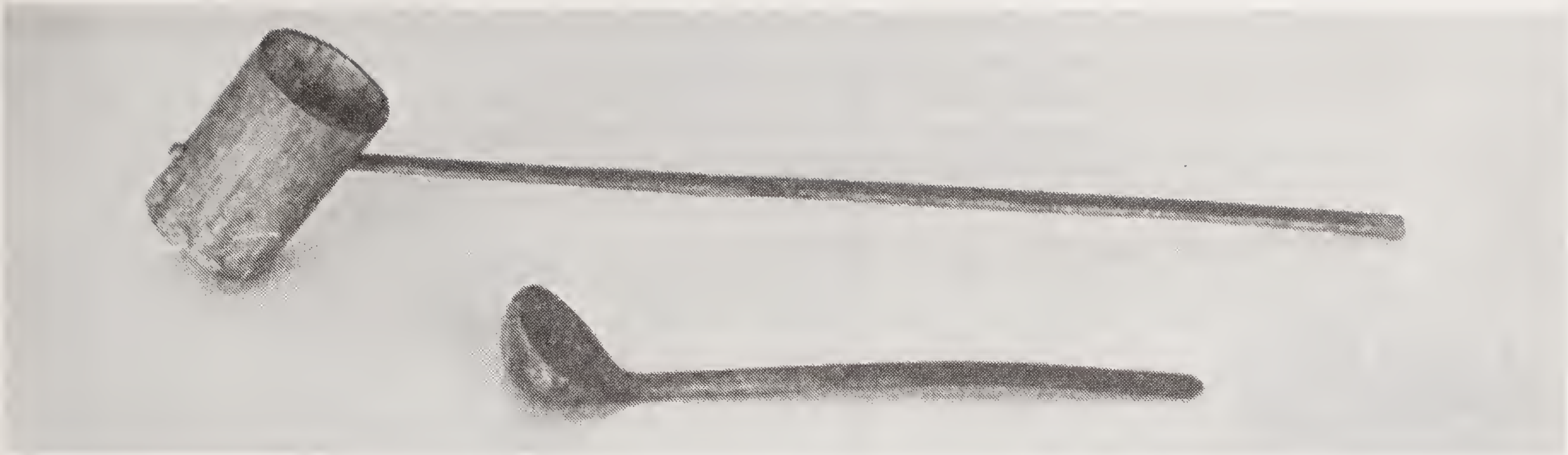
Hand fans made from split bamboo are sold at bazaars all over Assam (fig. 729). These are normally made from a woven bamboo mat to which a stiff splint of bamboo is attached on one edge. This splint acts as the handle. The shape of the mat could vary from a square to a circle and the weave structure normally used is the diagonal-weaving method. The edges in these mats are finished by tucking the elements back into the weave structure. The splint used for the handle is split down the centre and the mat held between is bound firmly by split-cane binding.

In some cases the woven mat is cut to the required shape and the edges are finished with a fine piping of braided-cane splits which is folded and stitched over the edge of the mat either by split cane or thread (fig. 730). The handle fixing detail is however uniform.

Dimasa Cachari Hand Fan

The Dimasa Cachari hand fan is similar to those found in the plains of Assam. The significant difference is the refinement in construction and the decorative patterns used in the weave of the mat. In some cases pre-dyed splits of bamboo are used to enhance the weave pattern. Finer splits are used in the mat and the Dimasa Cacharis carefully execute complex figured patterns on the surface (fig. 731).

One example, seen at Gangjung village near Haflong, incorporated an interesting revolving detail in the handle (fig. 732). The lower end of the handle is shaped to receive a split sleeve. This assembly is inserted into a whole bamboo element shaped like a test-tube and the split sleeve wedges inside while leaving the handle shaft free to rotate. The tube-shaped handle is further decorated with patterns applied by a hot poker. This results in a rather elegant product which is quite refined in construction.



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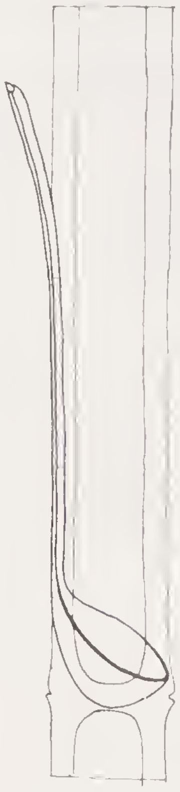
Angami Naga Bamboo Spoons

The Angami Nagas, like several other hill tribes, use spoons of varying sizes shaped from bamboo (fig. 733). The sample acquired from Khonoma is a small spoon used for drinking rice beer as well as a porridge-like preparation from a bamboo mug.

A bamboo culm of diameter 35 mm is shaped so that one nodal diaphragm is retained (fig. 734). A thick split extending from that node is shaped to form the handle and this split is bent slightly away from the axis of the culm for convenient handling. The lower part of the node and diaphragm are shaped by scraping with a *dao*, to create a soft rounded form.



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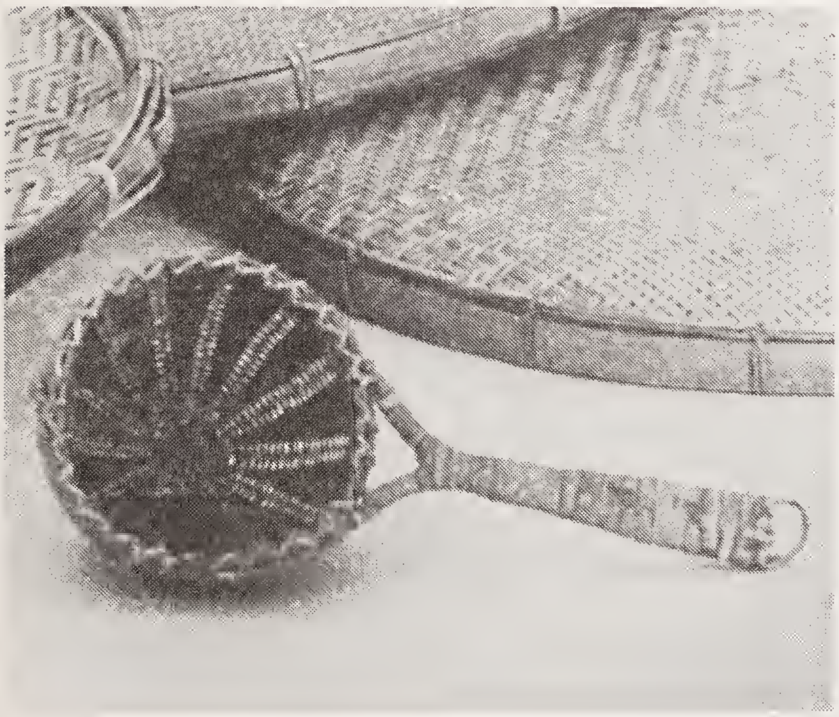
Apa Tani Bamboo Ladle

The Apa Tanis use an interesting bamboo ladle to lift water stored in their bamboo water tubes (fig. 735). It is made in two parts, the container and the handle. The container is a section of a bamboo whole culm with the nodal diaphragm acting as the base. Two holes are provided in opposite walls of the internode to receive the long handle which is made from a thick splint of bamboo. The end of the handle is tapered to fit tightly into the holes, which are aligned so that the handle is inclined to the axis of the container.



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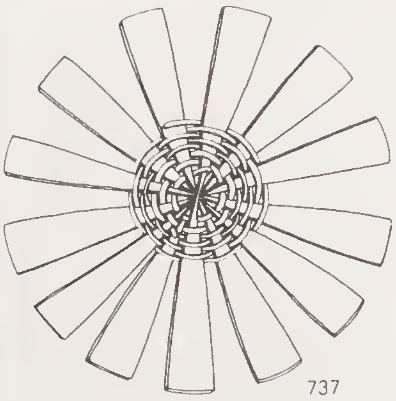

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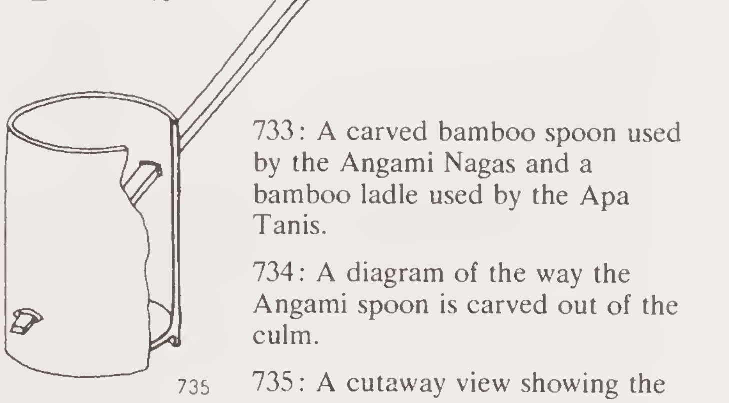

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733: A carved bamboo spoon used by the Angami Nagas and a bamboo ladle used by the Apa Tanis.

734: A diagram of the way the Angami spoon is carved out of the culm.

735: A cutaway view showing the construction of the Apa Tani ladle.

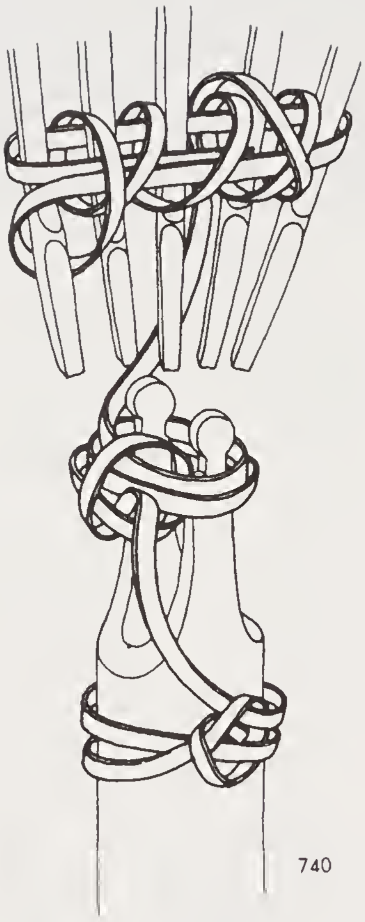
736: A tea strainer from Assam.

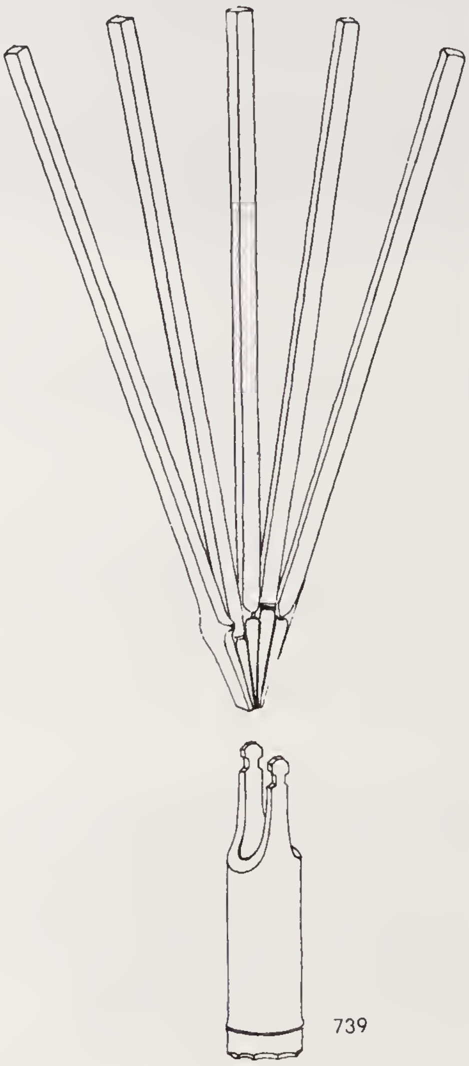
737: A flattened view of the centre of the tea strainer.

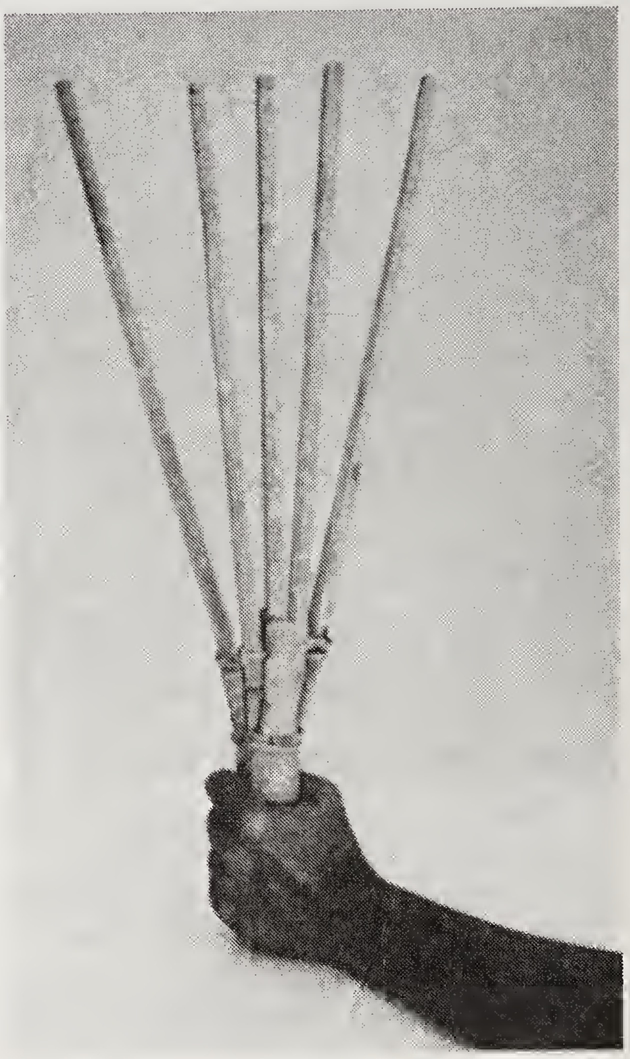
Tea Strainer from Assam

The tea strainer sold in emporia in Assam is made from split bamboo elements woven to form a conical container. The edge binding and the handle construction are in split cane (fig. 736).

The container is woven like a basket, using wide splits in the warp and very fine splits in the spiralling weft (fig. 737). The warp elements are thinned down in the middle and these overlap radially at the base of the conical shape. The rim is sandwiched between rings of split cane and bound, along with the split-cane handle, by split-cane binding.







738: The *kedzu*, an Ao Naga bamboo hay fork.

739: An exploded view of the handle and prongs.

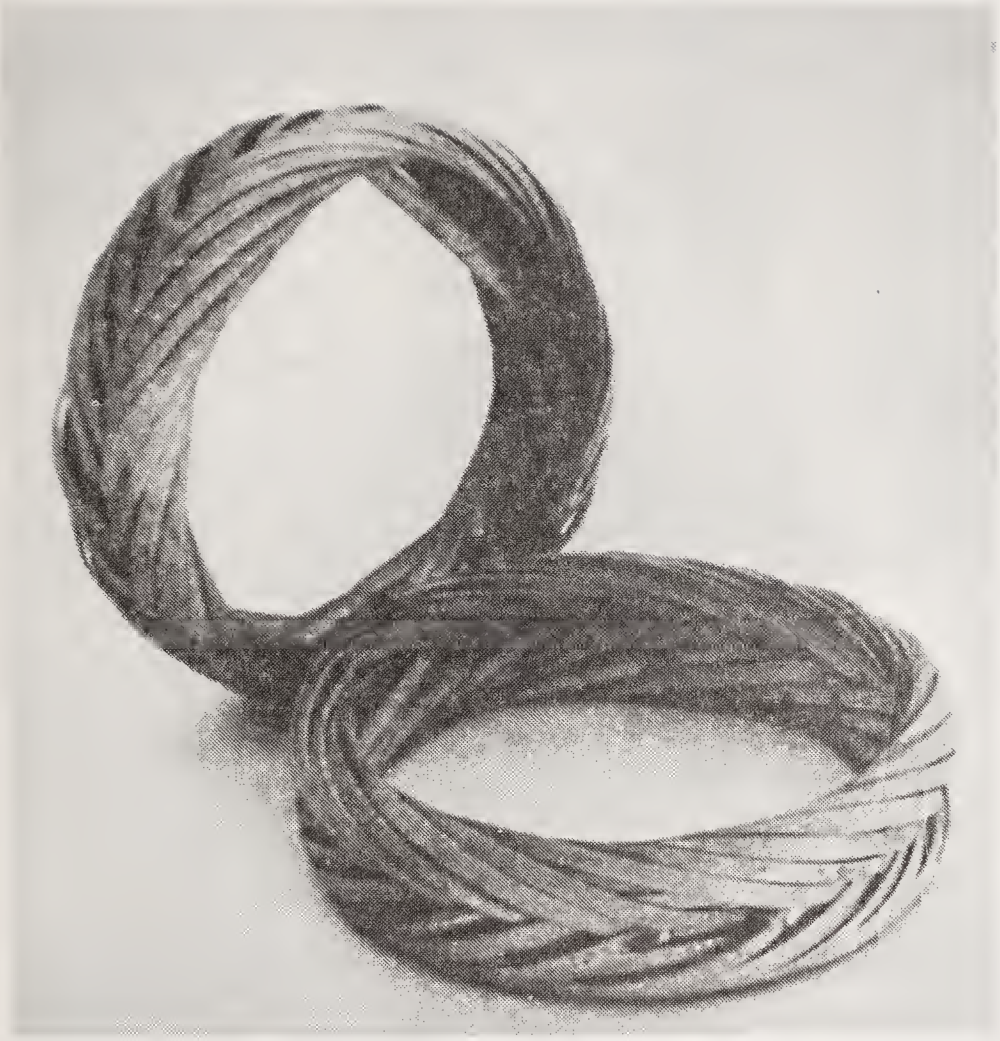
740: Detail of the binding that holds the prongs to the handle.

Kedzu

The *kedzu* is a hayfork used by the Ao Nagas for shifting grass and hay (fig. 738). It is made of bamboo and has a very interesting form and structure (fig. 739). The handle is a length of whole-culm bamboo into which has been cut a deep saddle shape. The whole assembly is bound together by a length of strong cane split. The fingers, made from a bamboo culm of large wall thickness which is split radially, have a square cross-section. The inner ends of these fingers are shaped like a wedge so that when placed in the handle each finger lies smoothly along the one adjacent to it while spreading fan-like at the outer end. The fingers are bound to each other in the required position with a length of split cane before being placed within the deep saddle cut in the whole bamboo handle such that the horns of the saddle extend over the central finger. The cane binding is continued around both horns to secure the fan-like structure to the handle (fig. 740). Details of structural significance here are the use of node portions protruding above the wedge-shaped end of the fingers but below the point of binding so as to prevent outward slippage of finger elements while the wedge shape tightens the assembly if any element were to move inwards.

Phaija

The *phaija* is a braided bamboo ring used for resting water pots (fig. 741). It is made and used by the Manipuris of Imphal Valley. Fairly thick splits of bamboo are used in the construction. These are 30 mm wide and 3 mm thick and are taken from a bamboo of a small diameter and wall thickness. The elements are looped to form a ring and they repeatedly



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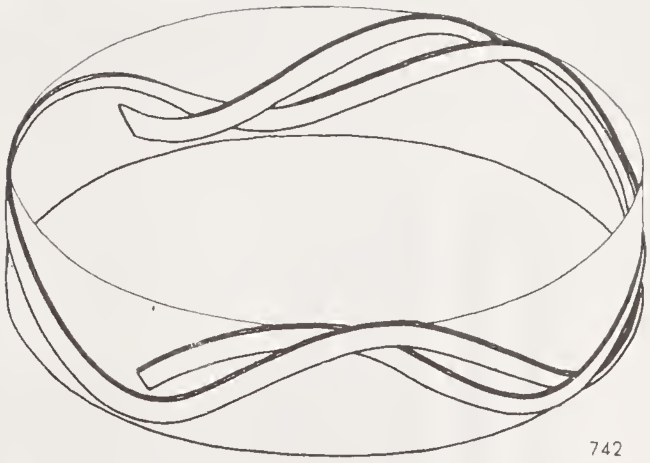

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interlace around the circumference in the form of a braiding (fig. 742). The external pattern is that of herringbone as the elements pass from the outer surface at the bottom of the ring to the inner surface at the top of the ring and vice versa. Once the ring is formed it is structurally extremely strong and no additional material is required to keep the splits in place. The tension in each bent split acts as the anchoring force.

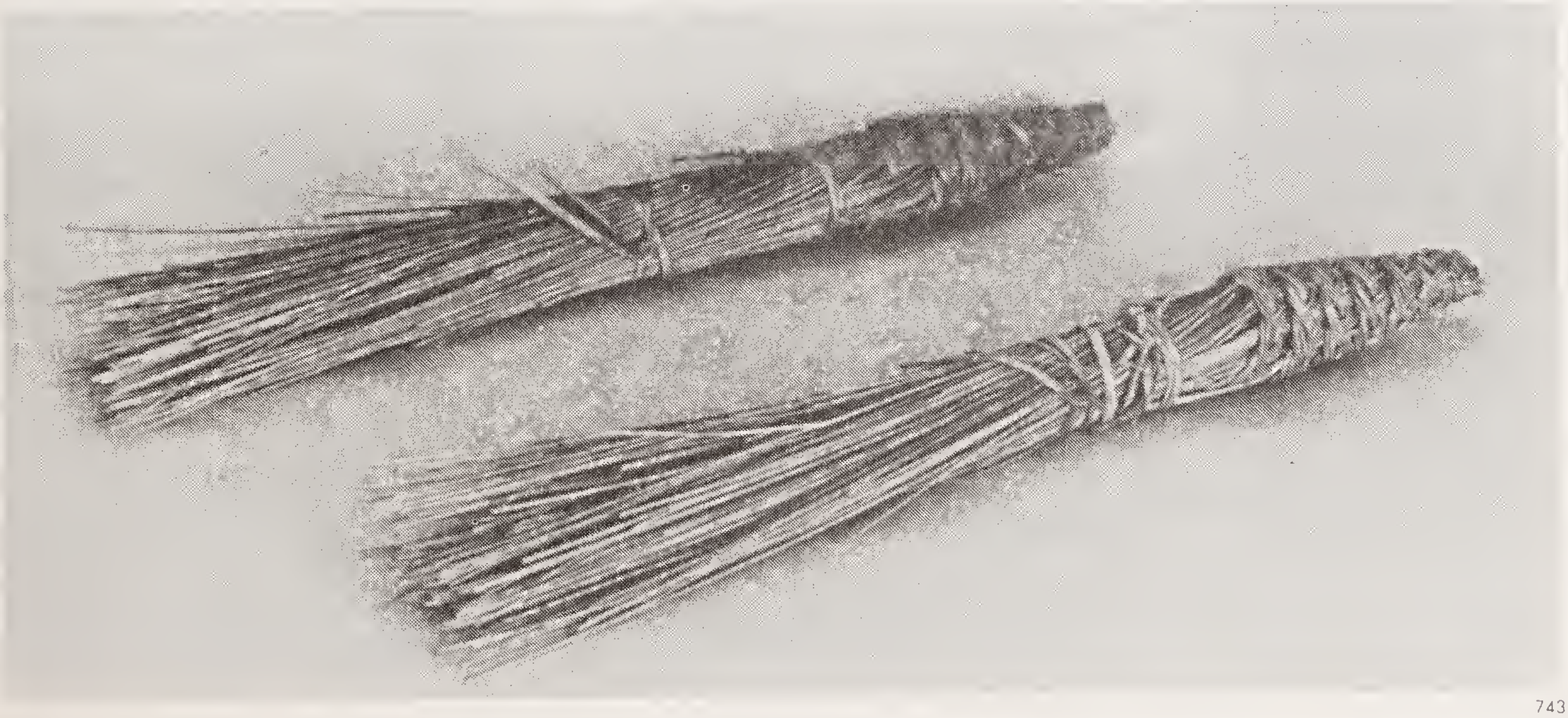
Bamboo Brooms

Brooms made from bamboo splits are used in the plains of Assam. The sample acquired from Golaghat in Assam has a very interesting construction (fig. 743). Fine bamboo splits are prepared with the help of a *dao*. These are fairly long and are taken in groups of threes or fours bent in the middle and interlaced with other sets, to form a chain-linked border with the length

741: A couple of *phaija*, the Manipuri bamboo rings used to support water pots.

742: A schematic diagram showing the construction of the *phaija*.

743: Bamboo brooms from Assam.



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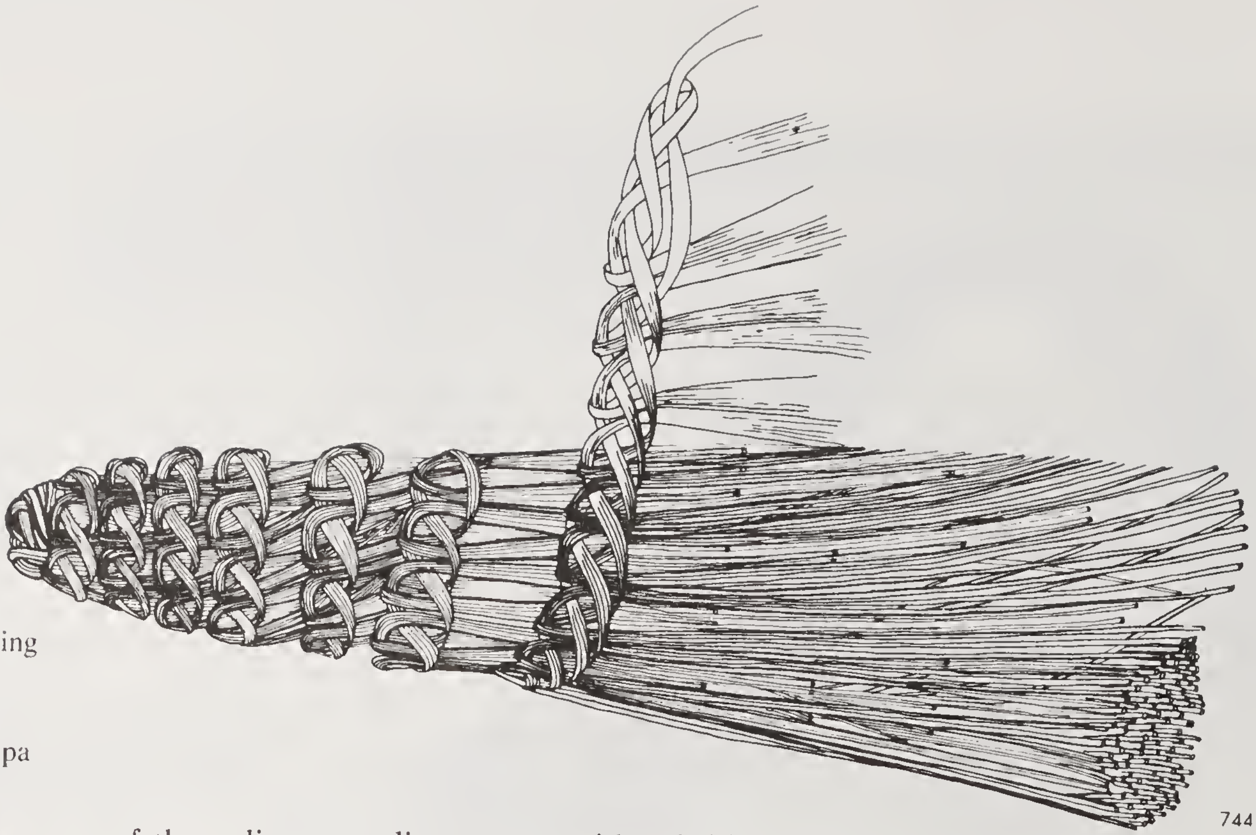


744: A schematic diagram showing the construction of the broom.

745: A comb carved out of one piece of bamboo, used by the Apa Tanis.

of the splits extending on one side of this border (fig. 744). This results in a long fringe like structure, held together at the border. With one edge of the fringe maintained as an axis, the rest of the border is twirled around this axis to form the conical handle before the end of the border is tucked in and the whole assembly is bound at one point by a split-bamboo binding.

Apa Tani Bamboo Comb

The Apa Tanis and Nishis of Arunachal use combs carved out of a single piece of bamboo (fig. 745). A wide chip of a fairly thin-walled bamboo is used. The combs have coarse widely-spaced teeth on one side and thinner closely-spaced teeth on the other. A part of the nodal ring separates the two sets of teeth. The internal nodal ring is cut flat on the inside of the comb, and the outside ridge is retained as a decorative element. These combs are functional as well as decorative.

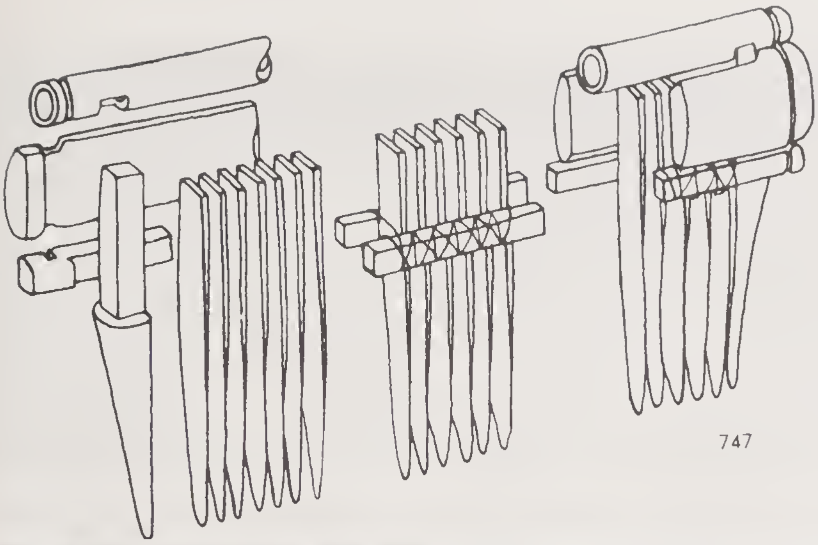
Khasi Bamboo Comb

The Khasi comb is intricately assembled from several splits of bamboo (fig. 746). A number of fine teeth are shaped from individual bamboo splits. These teeth are held sandwiched between a pair of thick splits and this assembly is bound firmly with cotton thread (fig. 747). The thread passes between the teeth to create the required gap. The two teeth located at either end of the comb are specially shaped from thick bamboo split in order to protect the fine teeth between them. The thread binding is coated with a thick sticky resin to permanently set the teeth in place. The teeth elements extend below the sandwiching binding and these are covered by two wide splits of bamboo to form the handle. Beyond these a single whole culm length of a very small diameter is used to finish the upper edge of the handle. The entire assembly is now bound with cotton thread to complete the product. This results in an extremely neat construction, very intricately made, though the product is sturdy and functional.

In another variation made by the Khasis, the handle is carved from soft wood and the bamboo teeth assembly which has been bound with thread is set into a groove at the bottom of the handle with the use of resin.

Smoking Pipes

Smoking pipes made from bamboo or cane are used by several hill tribes of the northeastern region (fig. 748). These pipes are normally made in two parts; the bowl in which tobacco is burnt and the stem attached to the bowl used to draw smoke into the mouth. The bowl is made either from cane or bamboo while the stem is a very thin whole culm; sometimes a length of branch is used.



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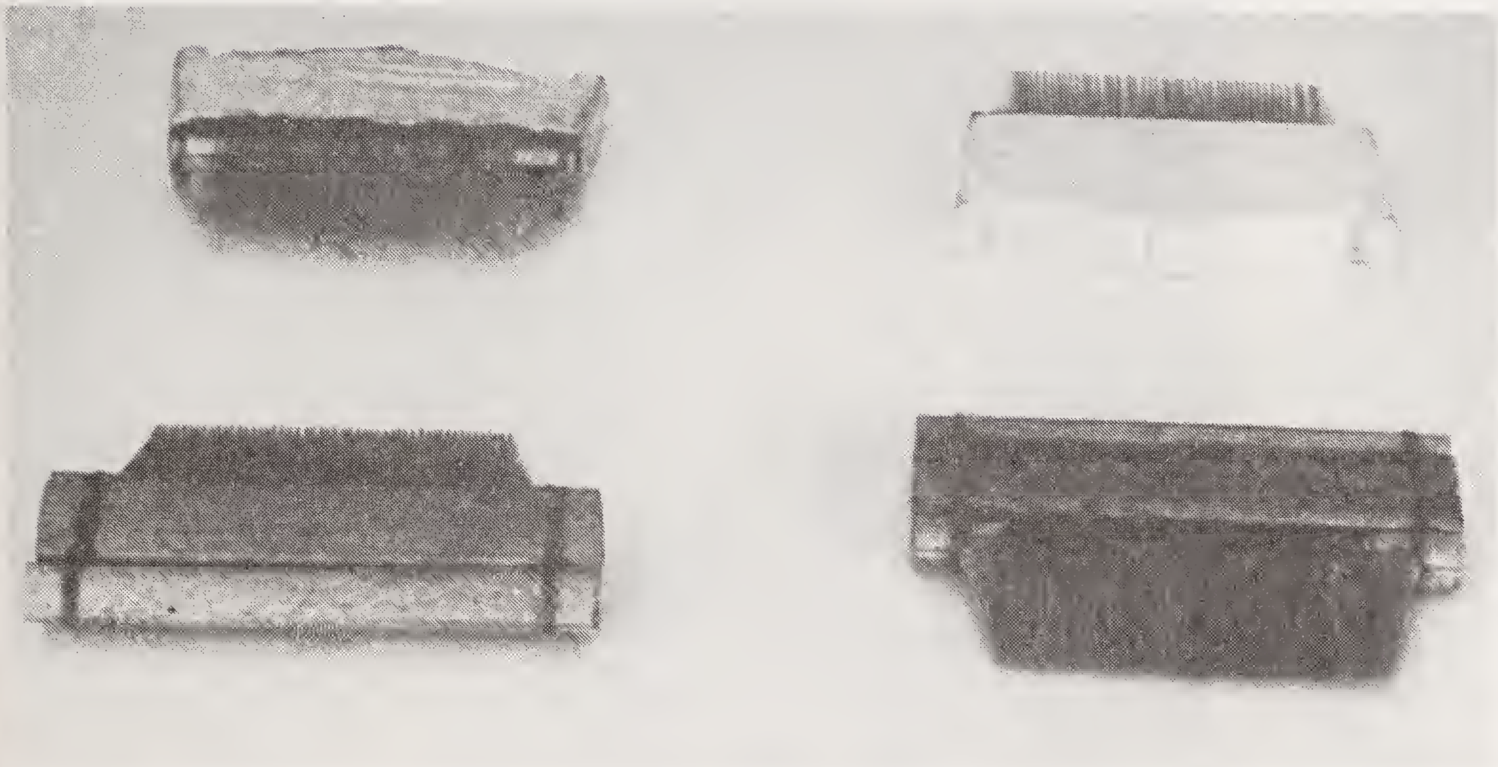
746: Bamboo combs used by the Khasis.

747: A cutaway view showing the construction of the Khasi comb.

748: Smoking pipes from Arunachal Pradesh. Clockwise from left: A bamboo tobacco container used by the Apa Tani women; An Apa Tani bamboo pipe; A Nishi cane pipe; and a Monpa pipe with metal fittings, seen at the museum at Hopoli.



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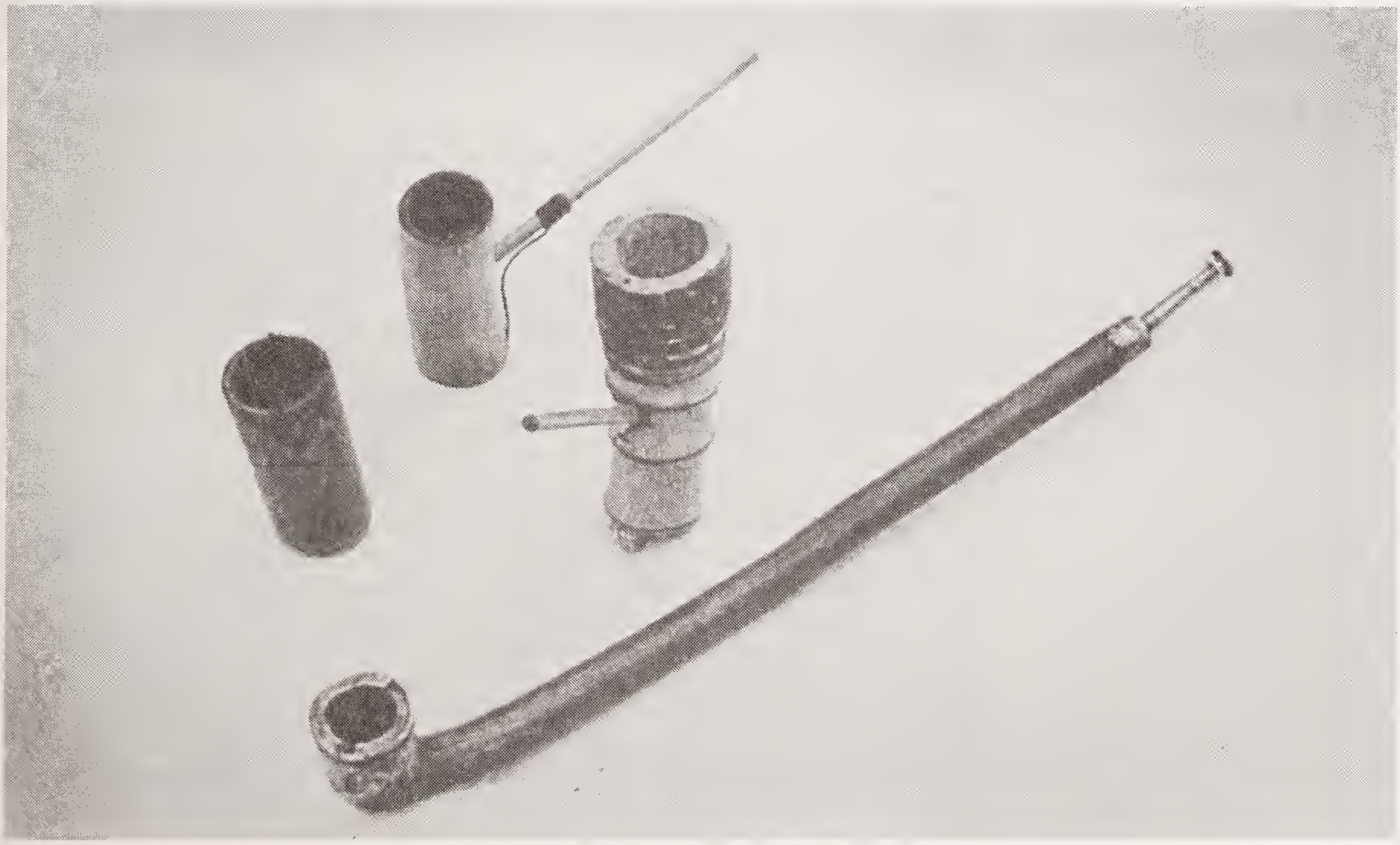

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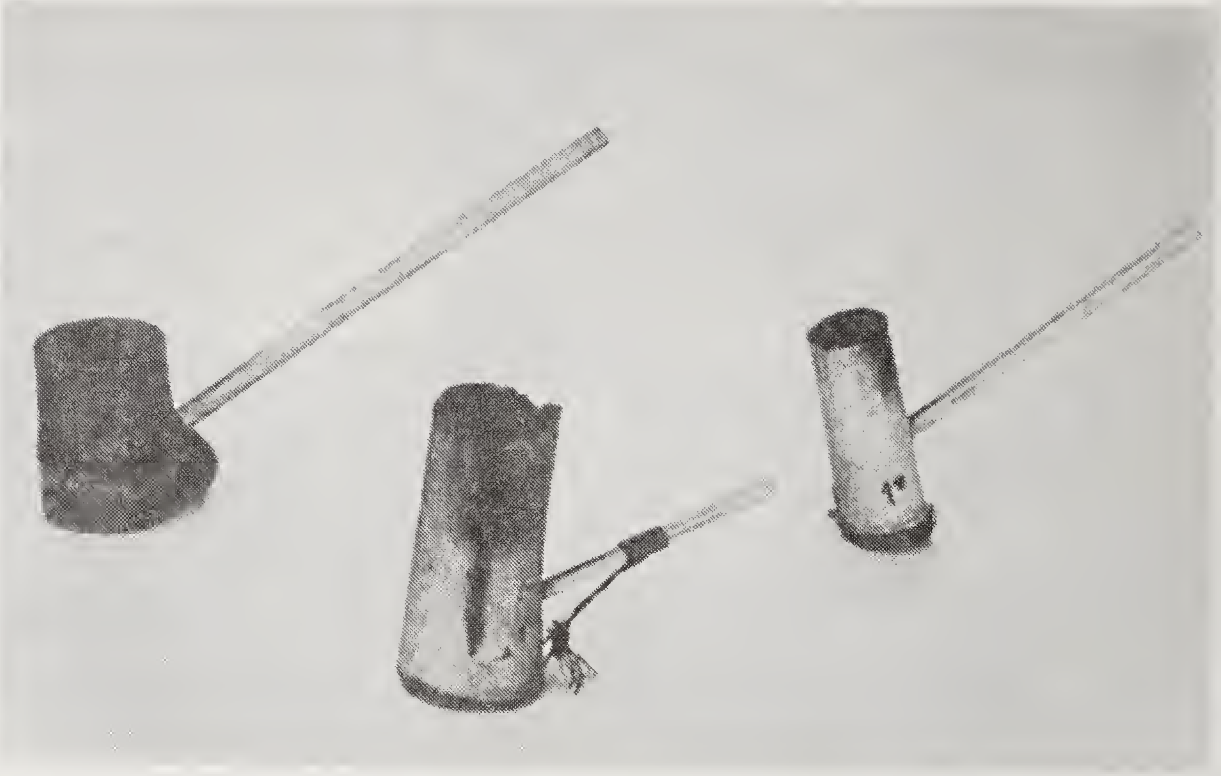
749: The *vaibel*, a Mizo pipe on the left, and a couple of *sudhums*, the Apa Tani pipes.

750: A sectional view of the *sudhum*.

751: A sectional view of the *vaibel*.



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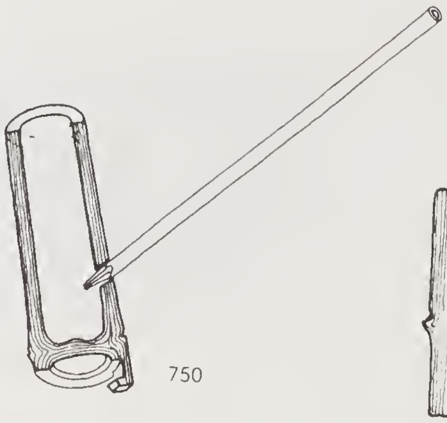

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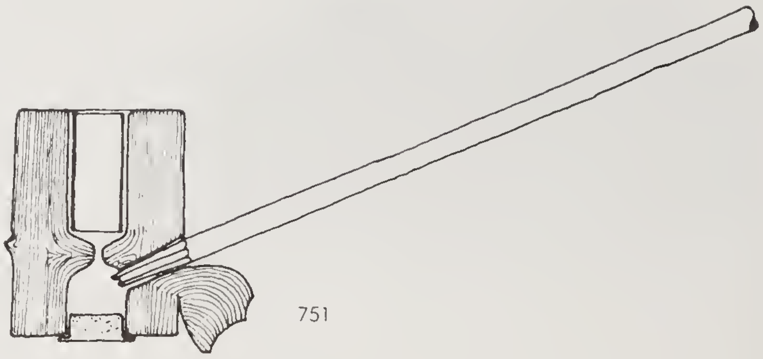

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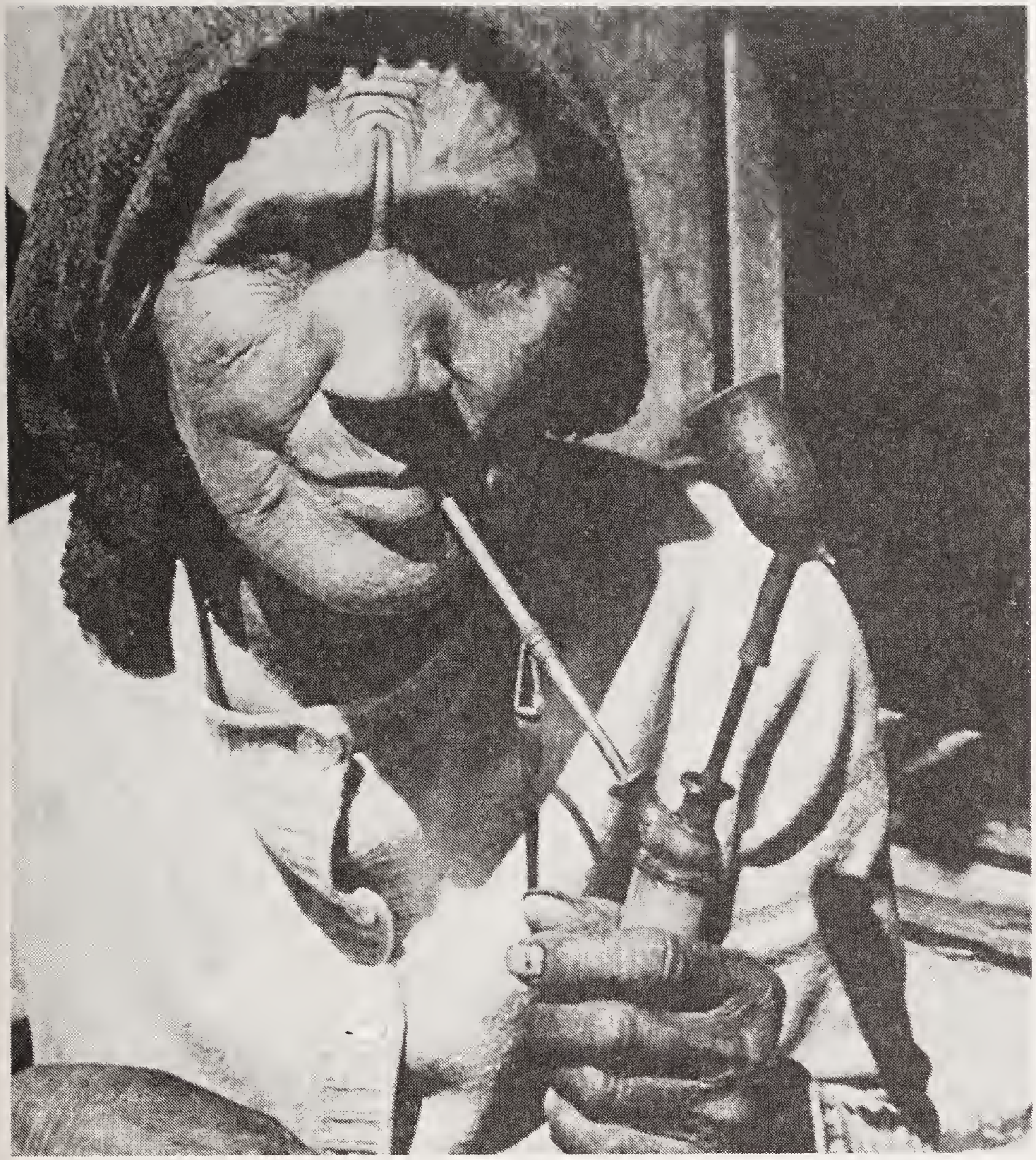
Sudhum

The Apa Tani smoking pipe is called *sudhum* (fig. 749). The bowl is made from a cane called *tarre* while the stem is made from the reed bamboo called *pepu*. The hollow of the bowl is created by burning to remove the soft pulpy centre of the cane. A hole is bored on the bowl to receive the stem, which is tied to the bowl by a length of cotton thread. When the stem is withdrawn from the bowl for cleaning it remains attached to the bowl through the thread. A similar pipe is made by the Apa Tanis where the bowl is made from bamboo (fig. 750).

The Nishi tribe of Subansari District in Arunachal makes a pipe similar to the Apa Tani one, and is called *hutusilli*.

Vaibel

The Lushai tribe of Mizoram makes a bamboo pipe called *vaibel* (fig. 749). The species of bamboo used is locally called *tursing*. It is a solid bamboo upto 50 mm in diameter and it is very strong as it does not break when dropped. A part of the culm including a node is used to shape the bowl (fig. 751). A portion of a branch that is retained at the node is shaped and in selecting the piece the major consideration is the aesthetic quality of this part. The hollow of the bowl is bored in the centre passing through the node in a small hole. The bamboo stem passes through the shaped branch segment to enter the hollow created below the node. The hole at the bottom is sealed with a piece of dried gourd. Locally grown tobacco is used and this pipe is used only by men as the Lushai women use a pipe called *tuibur*.



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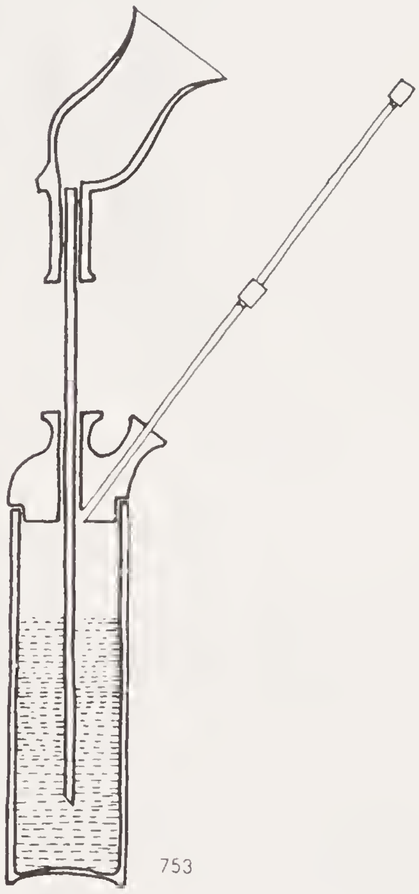

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752: A Mizo woman smoking her *tuibur*.

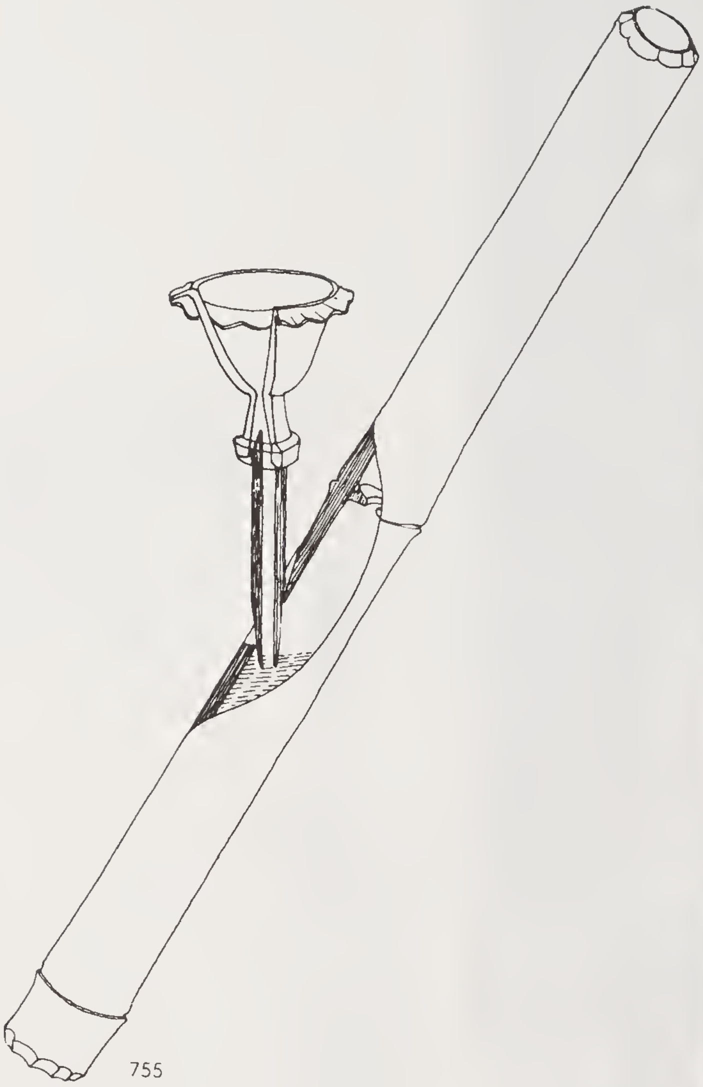
753: A sectional view of the *tuibur*.

Tuibur

The *tuibur* is made in an interesting combination of bamboo and clay (fig. 752). It consists of five parts connected to respective elements in housed joints wedged tightly together (fig. 753). The clay bowl called *tuibur-lu* rests on a long and slender bamboo tube called *phunthli*. This tube enters a carved central element called *tuiburlai* and passes into the water container to end below water level. The central element also receives the pipe stem called *tuiburdawn* which is inclined to the axis of the pipe. The water container called *tuibur-malong* is made from a length of bamboo with a node forming the base. The joint between the water container and the central element is covered and strengthened by a fine braided band made from a palm fibre. The central element is solid except for the holes to receive the two bamboo tubes. This element is shaped from a part of a rhizome.

Riang *Hookah*

The Riang tribe of Tripura uses a large *hookah* to smoke tobacco (fig. 754). It is made of three parts. A clay bowl is connected by a short bamboo tube to a bamboo water container (fig. 755). The container part is a fairly large-diameter whole culm and the length includes two internodes. The central nodal diaphragm is knocked out while the lower node is retained to become the water container. The short bamboo tube made from a small diameter bamboo penetrates into the container to end below water level, while the other end receives the clay bowl in which the tobacco is burnt.



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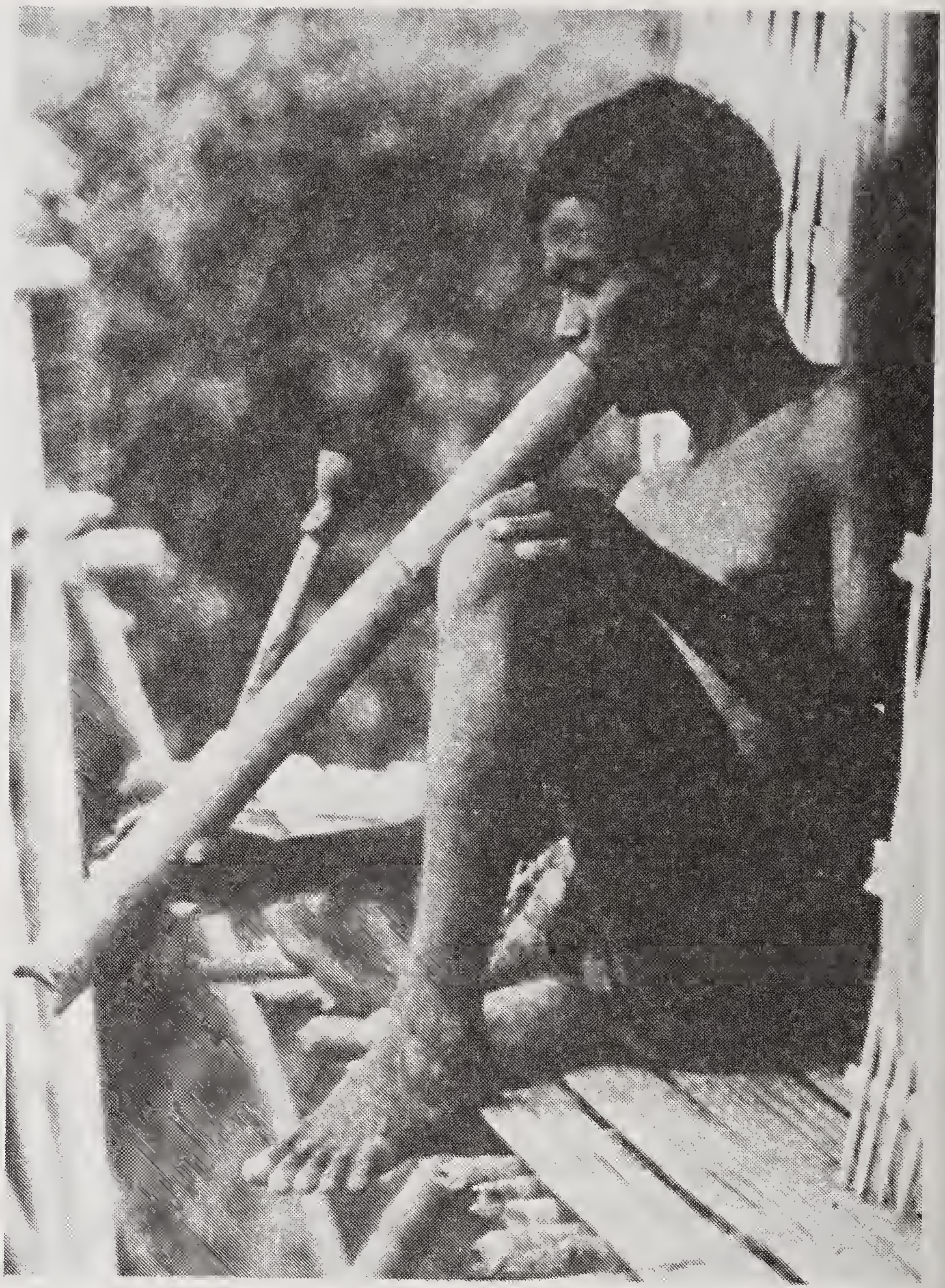

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754: A Riang tribal smoking his *hookah.*

755: A cutaway view of the Riang *hookah.*

While smoking this *hookah* the Riang tribal cups his hand over the open end of the bamboo container leaving a small gap between his hand and the edge of the opening. The mouth is applied to this gap in order to draw smoke which first passes through the water stored inside the container. The Dimasa Cacharis of Assam use an identical form of *hookah.*

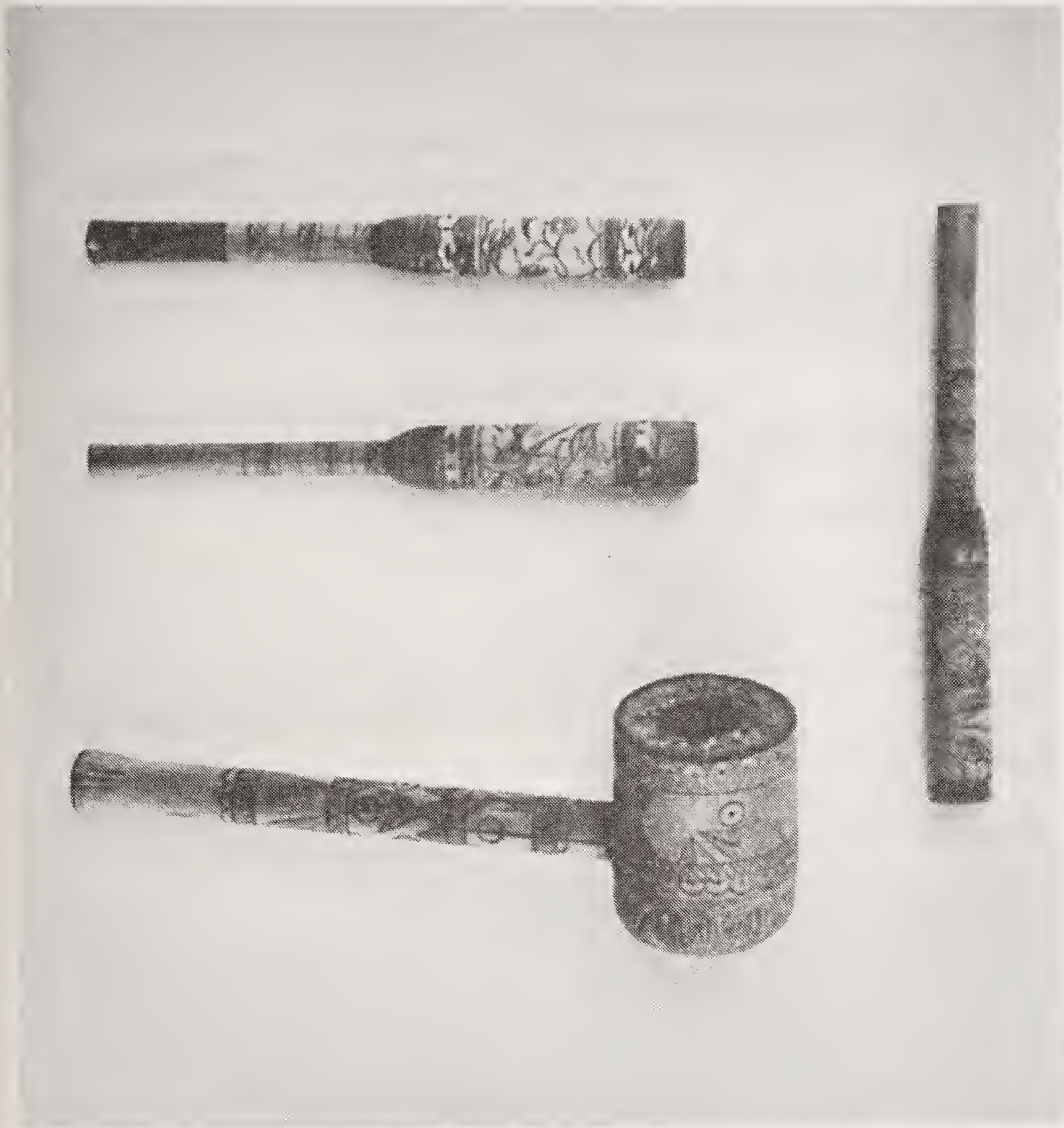
Khasi Bamboo Pipes

The Khasi pipe is a simple construction incorporating a bamboo bowl connected to a bamboo pipe stem made from a length of branch (fig. 756). The surfaces of both bowl and stem are decorated with motifs scored on the outer skin by a sharp instrument.

A bamboo cigarette holder has been evolved using similar motifs on the surface. The holder has two parts connected along a common axis. The part that receives the cigarette is larger in diameter than the stem.

Yet another pipe which uses bamboo was acquired from Shillong's Bara Bazaar (fig. 757). This is a combination of bamboo, wood, metal and horn. The bowl is made from a part of a bamboo rhizome with the impression of the buds retained on the surface as decoration. The stem is made from wood and horn with a metal connection between them. The wooden part is fixed permanently to the bowl while the horn element is detachable for cleaning.

Recent versions of this pipe incorporate a ceramic lining on the inner surface of the bowl after the hollow of the bowl has been sufficiently enlarged.



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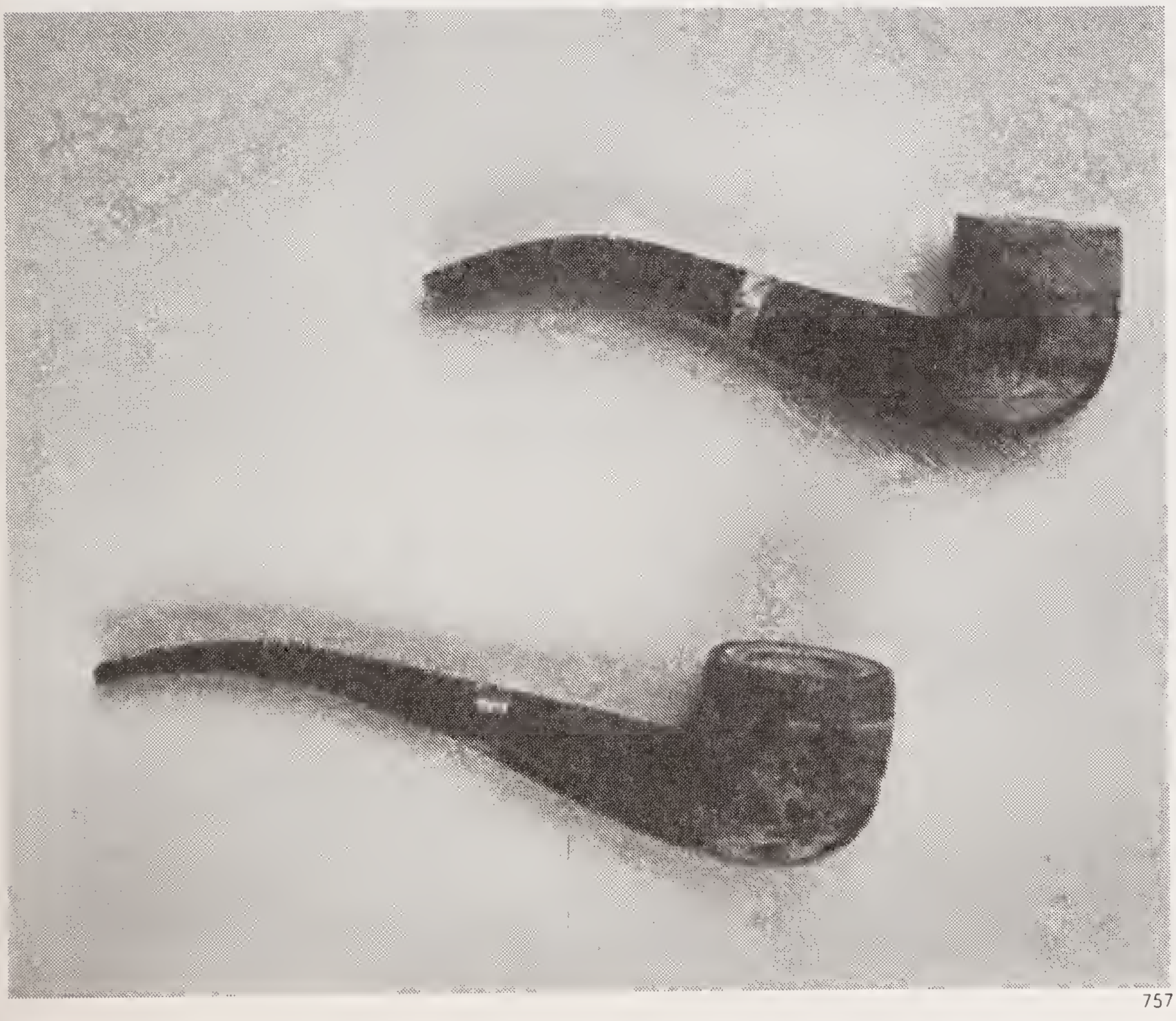

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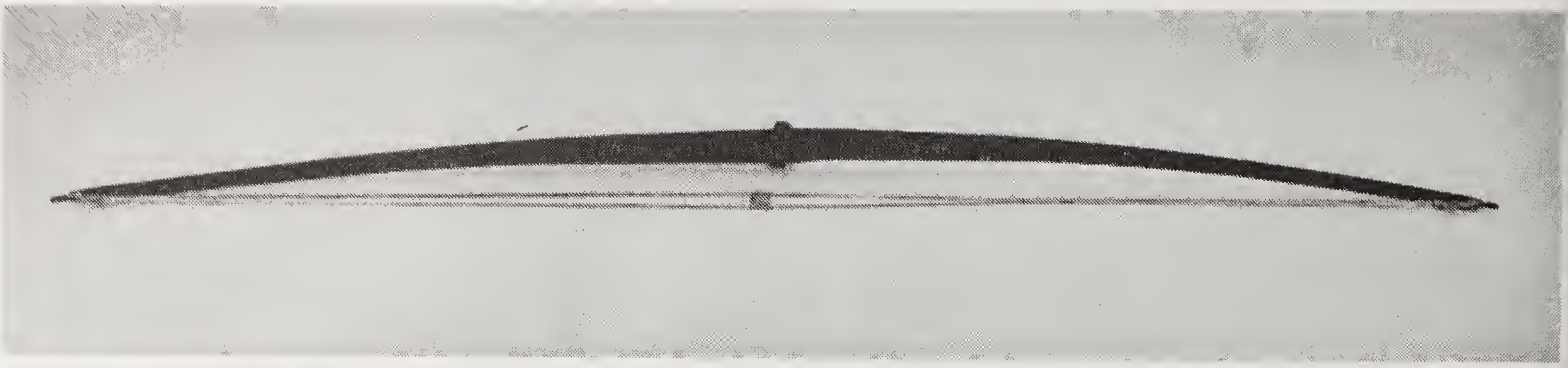
756: Khasi bamboo pipes and cigarette holders.

757: Pipes with bamboo bowls from Shillong.



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Weapons, Tools and Accessories

Several types of weapons, tools and accessories are made from bamboo and cane. These include devices for war and hunting, agricultural tools, weaving aids, and tools for craft and construction work. As in the other products, they reflect the individual character of the tribe which makes and uses them.

Sairawkher

The *sairawkher* is a bow made by the Lushai tribe of Mizoram and used to hunt birds and small animals (fig. 758). Unlike the usual bow, this one fires clay pellets instead of arrows. It consists of a strong beam made from a wide splint of bamboo which is held bent in tension by a bow-string made from a fine bamboo split. The beam is made from *rawthing* bamboo while the bow-string is from *sairil* bamboo. Both ends of the beam are shaped to receive the string, which is anchored firmly at one end while the other end has a loop which can hook on to a notch in the beam. This detail permits the bow to be stored after the tension is relaxed by unhooking the string.

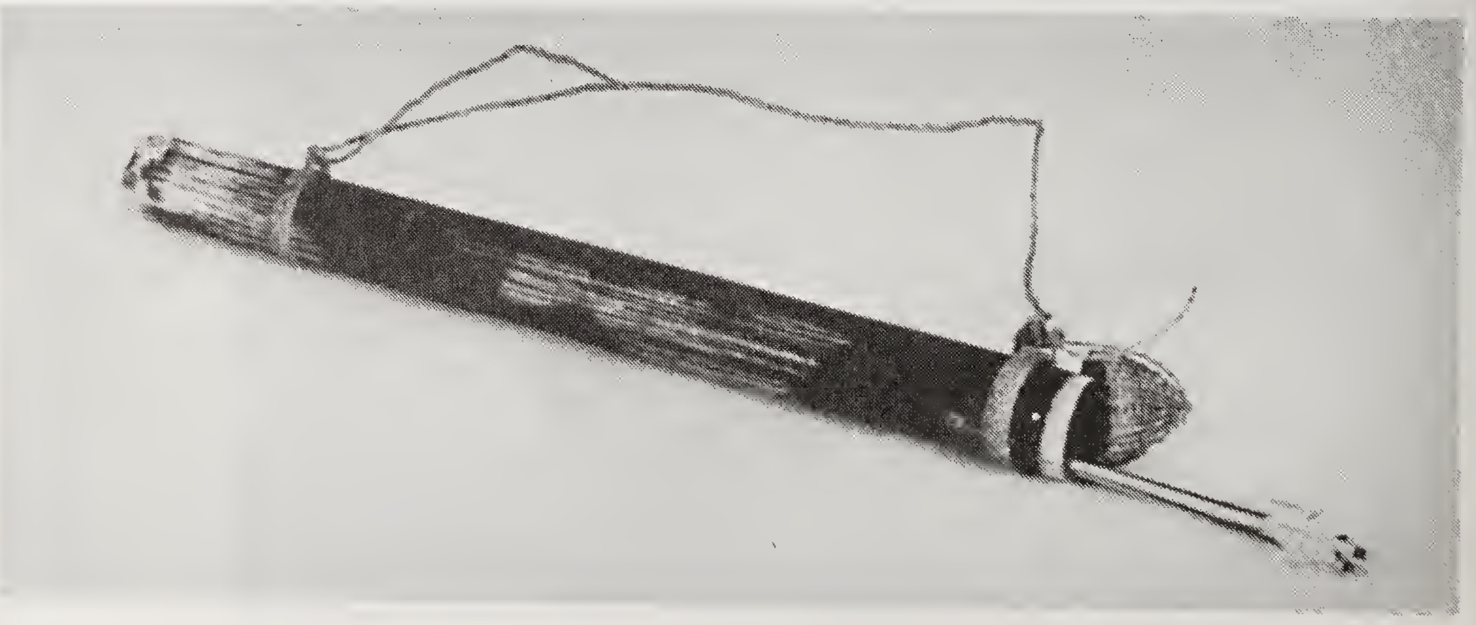
The bamboo split that forms the string is separated into two splits in the centre and these are held apart by a cradle made of fine split-cane binding. The cradle is used to support the clay pellet when the bow is drawn. The bow requires some skill in operating as it has to be twisted slightly to one side to permit the pellet to sail past without striking the beam.

Apa Tani Bow

Several tribes in Arunachal make bows and arrows from bamboo. The Apa Tani bow has a strong beam made from a wide split of bamboo while the bow-string is made from a twisted palm fibre. The arrows are made from thick splits of bamboo, with the tip shaped to a fine point while at the back

758: The *sairawkher*, a Lushai bow used for small game.

759: A bamboo quiver with arrows, used by the Apa Tanis.



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wide bamboo splits form the feathers. These arrows are carried in a quiver made from a whole culm with a node forming the base. The lid of the quiver is woven from split cane and split cane braided bands around the tube anchor the shoulder strap which is a strong rope twisted from several strands of split cane.

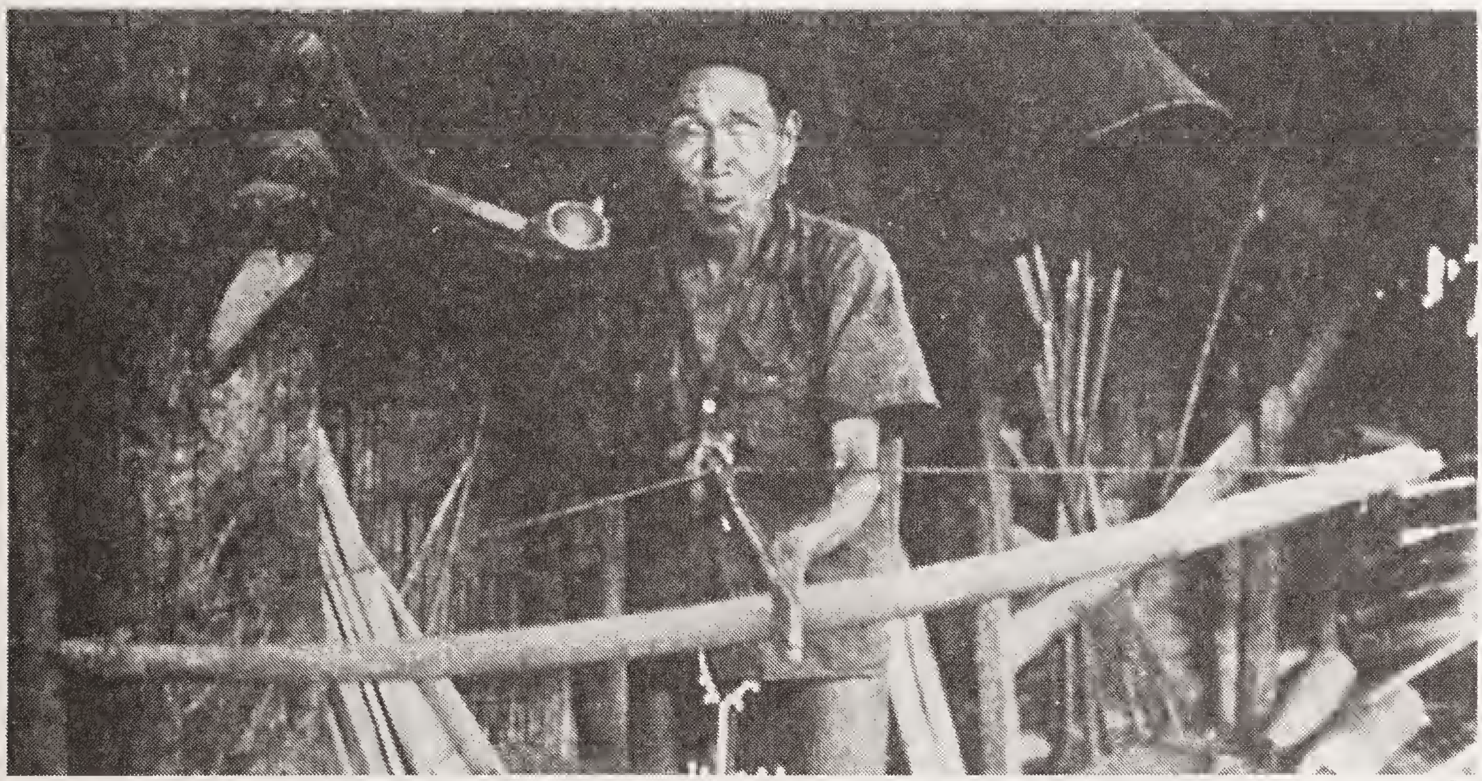
Apa Tani Quiver and Arrows

The arrows used with the bamboo bow are made from thick bamboo splits which are shaped to a point at one end and stabilised with feathers at the other. The feathers are made from shaped bits of culm sheath held within a split and bound with thread.

These arrows are carried in a whole bamboo quiver, which is a long bamboo tube with its lower end closed by a nodal diaphragm (fig. 759). The other end is closed by a woven lid of split cane. The quiver is carried over the shoulder by a strap made of twisted cane rope. The shoulder strap is knotted to split-cane loops attached to a pair of cane bands which are braided around the whole-bamboo container.

Chang Naga Cross-Bow

The Chang Naga cross-bow is a powerful weapon made of bamboo, wood, fibre and bone. It is made of a thick and strong bamboo beam, wider at the centre than the ends, held in a slot in the wooden cross-beam. The wooden cross-beam has a groove at the top on which the arrow rests. Towards the back of the cross-beam, a trigger assembly made of bone is used to hold the bow in tension as the bow-string made of fibre rope is held by the back of the trigger (fig. 760).



760: A Chang Naga crossbow held ready to receive an arrow.

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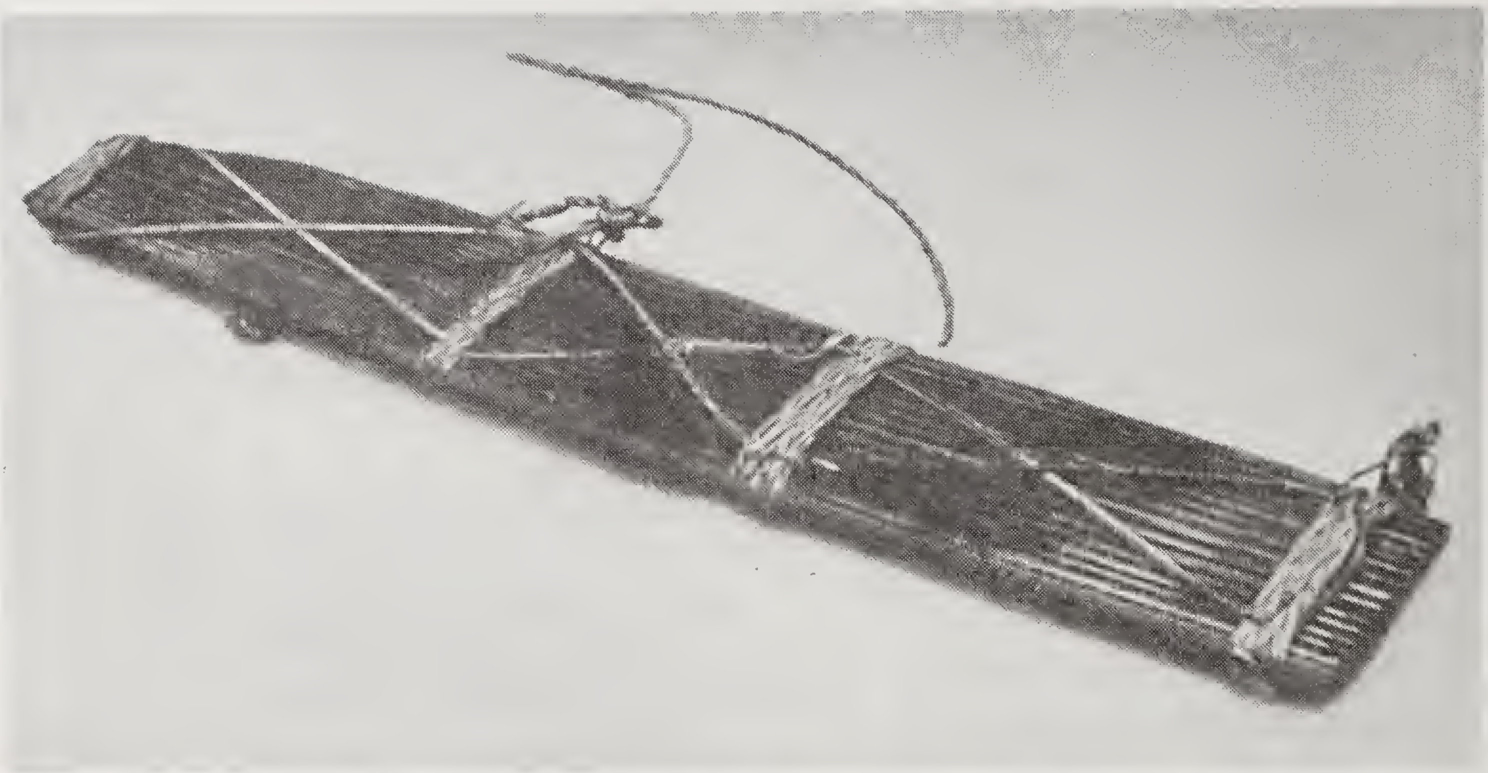
The bow is held at arms length with both hands firmly on the cross-beam holding it from below. When the trigger is pulled the hook is depressed permitting the bow-string to propel the arrow with great force. A good deal of strength is required to charge the bow as the bamboo beam is fairly thick and not easily bent. These bows and in particular the cross-bow show an interesting use of the property of resilience found in bamboo.

Dao and *Dao* Sheath

For most tribes in the northeastern region the *dao*, a flat-bladed knife, is an indispensable and multipurpose tool. It is used for their craft activity, in the *jhum* fields for cutting and clearing vegetation, in the forest for protection against wild animals and for cutting firewood. At times it serves as a lethal



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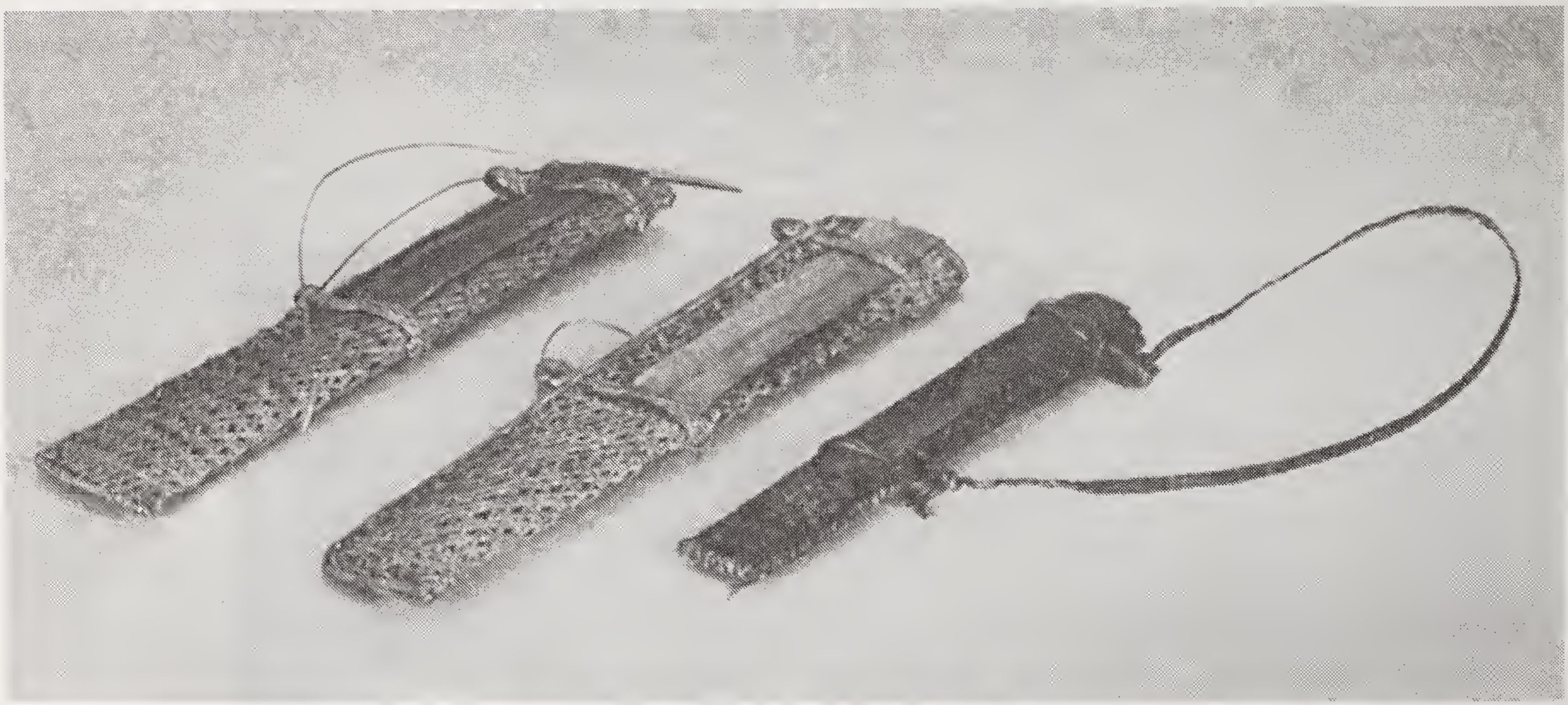

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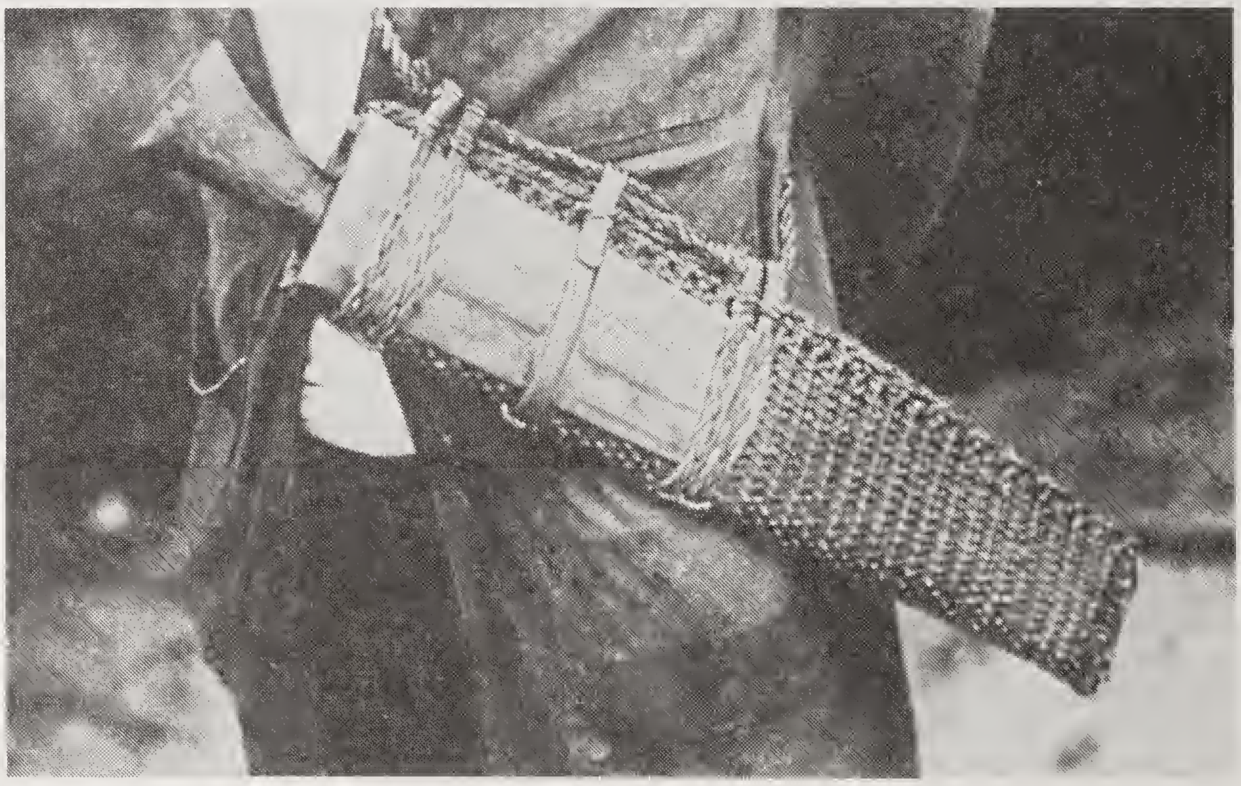
761: The *bukhya*, an Apa Tani *dao* case, seen at the museum at Hopoli.

762: Three *hobuks*, the Adi Gallong *dao* cases.

763: The position of the *hobuk* as it is slung on the shoulder.



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weapon. Hence, each adult male can be seen carrying a *dao* on his person wherever he goes. The shape of this *dao* varies from tribe to tribe and the device or sheath used to carry these also takes on different forms.

Most Naga tribes use a block of wood provided with a slot to receive the steel blade while the wooden *dao* block is attached to a woven waist belt. Most tribes in Arunachal use *dao* sheaths made of bamboo or cane (fig. 761). The form and structure of these reflect the tribal identity just as the shapes of the *dao*. A few of these *dao* sheaths are described below.

Hobuk

The *hobuk* is the woven *dao* sheath used by the Adi Gallong tribe of Arunachal (figs. 762, 763). It is shaped like a long rectangular pouch open from one end. Two braided bands are attached around the rectangular cross-section, one near the mouth and the other halfway down its height. These bands end in loops which receive the braided and twisted shoulder strap. The *hobuk* is 420 mm long and 90 mm wide with a maximum thickness of 20 to 25 mm.

The body of the *hobuk* is fabricated from a woven mat. The flat mat is woven using the open-hexagonal weave with its two inclined diagonals filled by additional elements. This mat is twice the width of the *hobuk*. It is folded over and two overlapping edges are attached together leaving one of the shorter edges open to become the mouth. The edges of the mat are strengthened by thick splits running around these to return across the face of the mat.

The *hobuk* could be made from either bamboo or cane splits, though cane is preferred as it is more durable. Two long strips of palm leaf called *korsik* are each bent double and slipped over both edges of the mouth so that one end lines the inner surface and the other lines the outer surface. These leaf strips reduce the gap between the woven walls of the pouch so that the blade of the *dao* is pressed firmly between these layers.

Apa Tani *Dao* Case

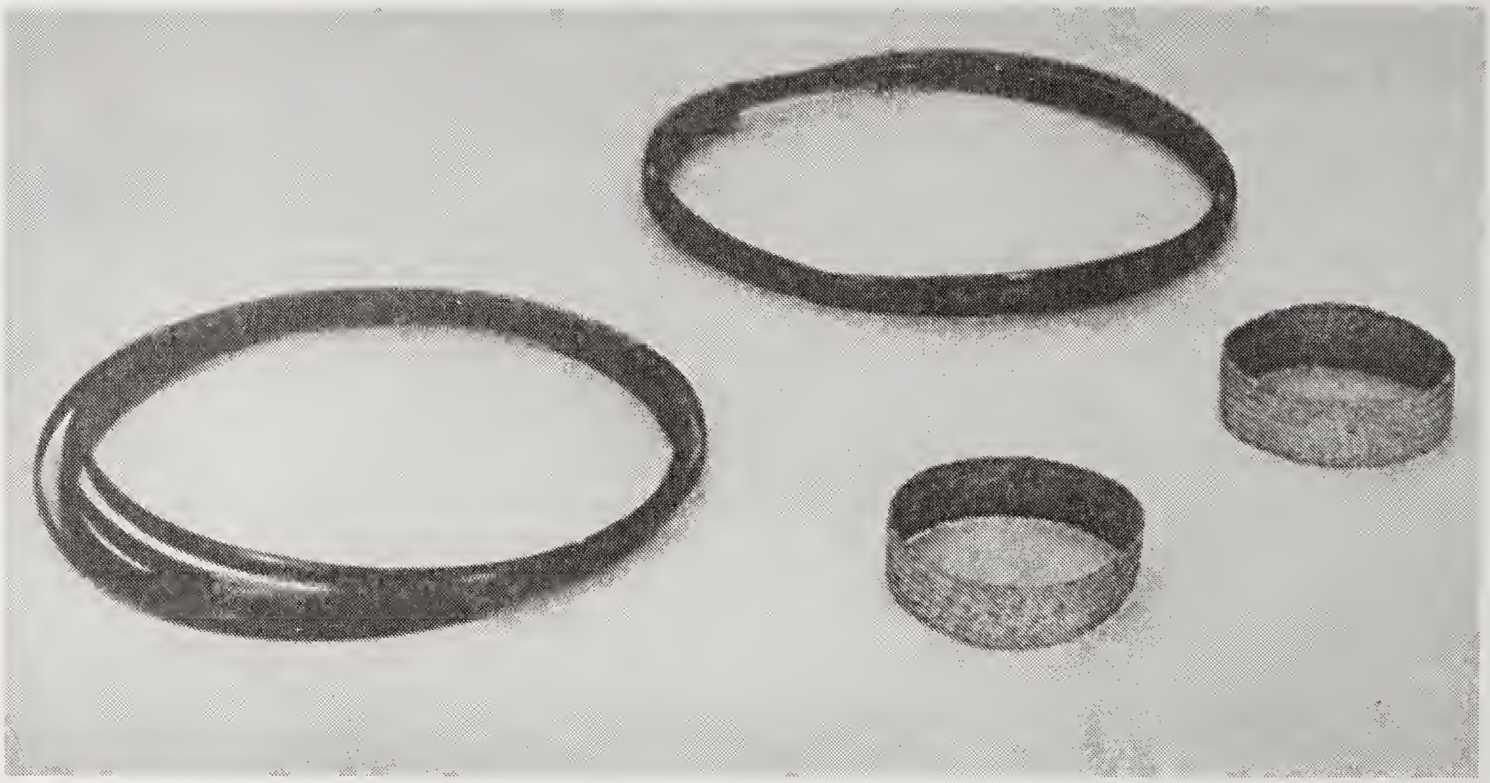
The Apa Tani *dao* case is an elongated rectangular sleeve made to suit their *dao* which is long and straight. The *dao* case is made from a pair of flattened bamboo sheets held face to face. The cross-section of each sheet is slightly cupped so that the space between them can accommodate the *dao*. The inside surface of the sheets are shaped to ensure a perfect fit. The two sheets are held together by braided bands of split cane located at several points along the length of the *dao* case. The shoulder strap, either braided or made from twisted cane rope, is knotted to a couple of these braided bands.

Tribal Costume Accessories

A number of tribes all over the Northeast use cane and grasses to make accessories to complement their costumes. Some of these are worn every day and some only on ceremonial occasions.

Phipha

The *phipha* is one of a pair of leggings worn by Angami and Ao Naga men of Nagaland. It is like a sleeve, open at both ends, with the top wider than the bottom and is worn over the calf to cover most of the leg between the knee and ankle. It is woven in a diagonal twill weave with very fine splits of cane. The lower portion, which has a slit along the side, is woven in natural coloured cane while the top portion—almost three-fifths of the length—is woven with splits of cane dyed a deep red colour. Bright yellow strips of orchid stem are used sparingly to make decorative patterns on the *phipha*. Tufts of coloured wool are also used as decoration.



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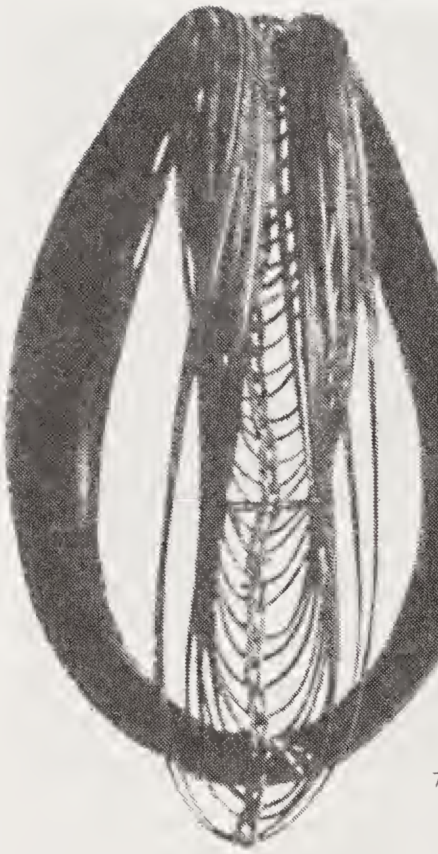

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Apa Tani Knee Bands

The Apa Tani men wear circular braided bands just below their knees. The bands are about 25 mm wide and protect the leg muscles from strain during long journeys on foot. It is made from very fine splits of cane and is very flexible (fig. 764).

Konyak Naga Belt

The Konyak Naga men wear a tight cane belt around their waists. These are made of half splits of cane wound around the waist in about seven or eight loops. The belt is worn by adults and, once it is put on, it is not removed until the man dies. The cane, due to constant contact with the body and body oils, becomes beautiful golden yellow in colour.

Wancho Belt

The men of the Wancho tribe in Arunachal also wear a cane belt around their waists (fig. 764). It is made from a half split of cane which is loosely wound around the waist in a number of coils. It is worn when the men go out, and is removed at home. The most interesting aspect of these belts is their glowing rich black colour, which is obtained by a very simple process.

Oak

The Tagin men of Arunachal wear a number of loose coils of cane called an *oak* around their waists (fig. 765). Each ring is made separately by coiling a split of cane in a couple of loops which are then bound together with very fine splits of cane. Brown and natural coloured splits are used for binding the cane in a decorative manner. A number of such rings are worn around the waist simultaneously.

Huktak

This is a cane brassiere worn by the Hill Miri women of Arunachal (fig. 766). It is a cylindrical ring, about 75 to 80 mm wide, and is made up of thin coiled splits of cane. These are held together with a decorative binding of a very fine split of cane. The *huktak* is apparently slipped on over the head and worn like a belt tight across the breasts.

Ahu

This is a bright red vegetable dyed waist belt worn by the Apa Tani men of Arunachal (fig. 767). It is being used less frequently these days as the

764: Apa Tani knee bands and the black Wancho belt.

765: The *oak*, a Tagin waist-band, seen at the museum at Along.

766: The *hutak*, a brassiere worn by the Hill Miri women, seen at the museum at Along.

767: The *ahu*, a waist-band with a tail worn by the Apa Tani men, seen at the museum at Along.

768: Fine bamboo chains used as a decorative element on a Wancho basket.

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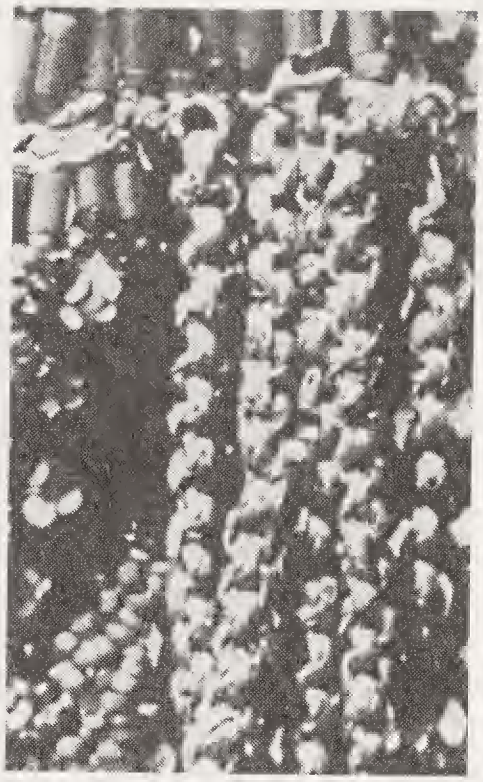

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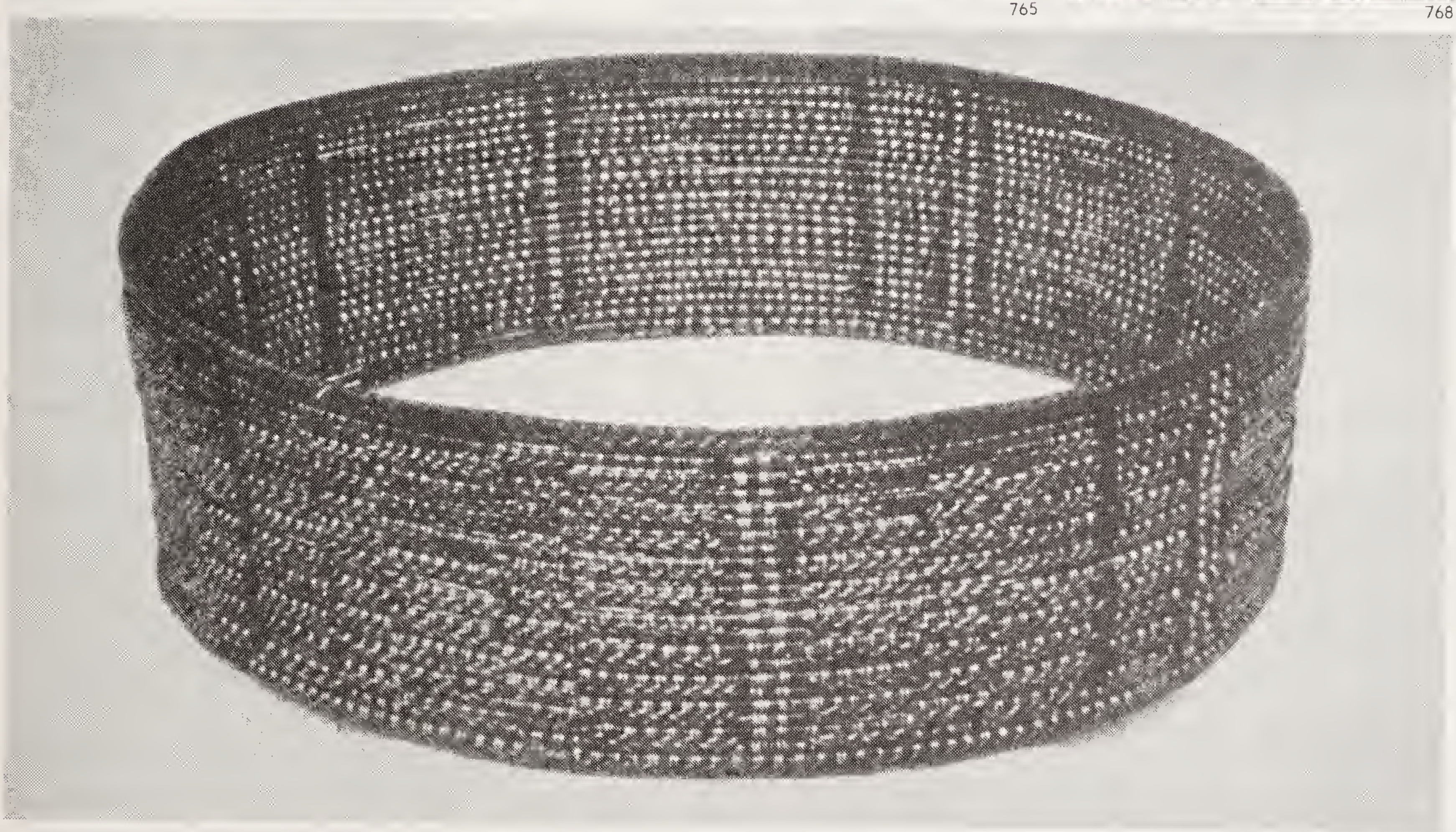

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young men seem to have stopped wearing it. The *ahu* is made of several split-cane elements that go around the waist and form a tail-like loop hanging at the back. These elements are held together only at the back where the binding holds the elements of the tail in shape. The tail which is round at the end is shaped like a beaver's tail. In front the coils are loose as there is no binding. The cane species used by the Apa Tanis is different from that of the Angami Nagas.

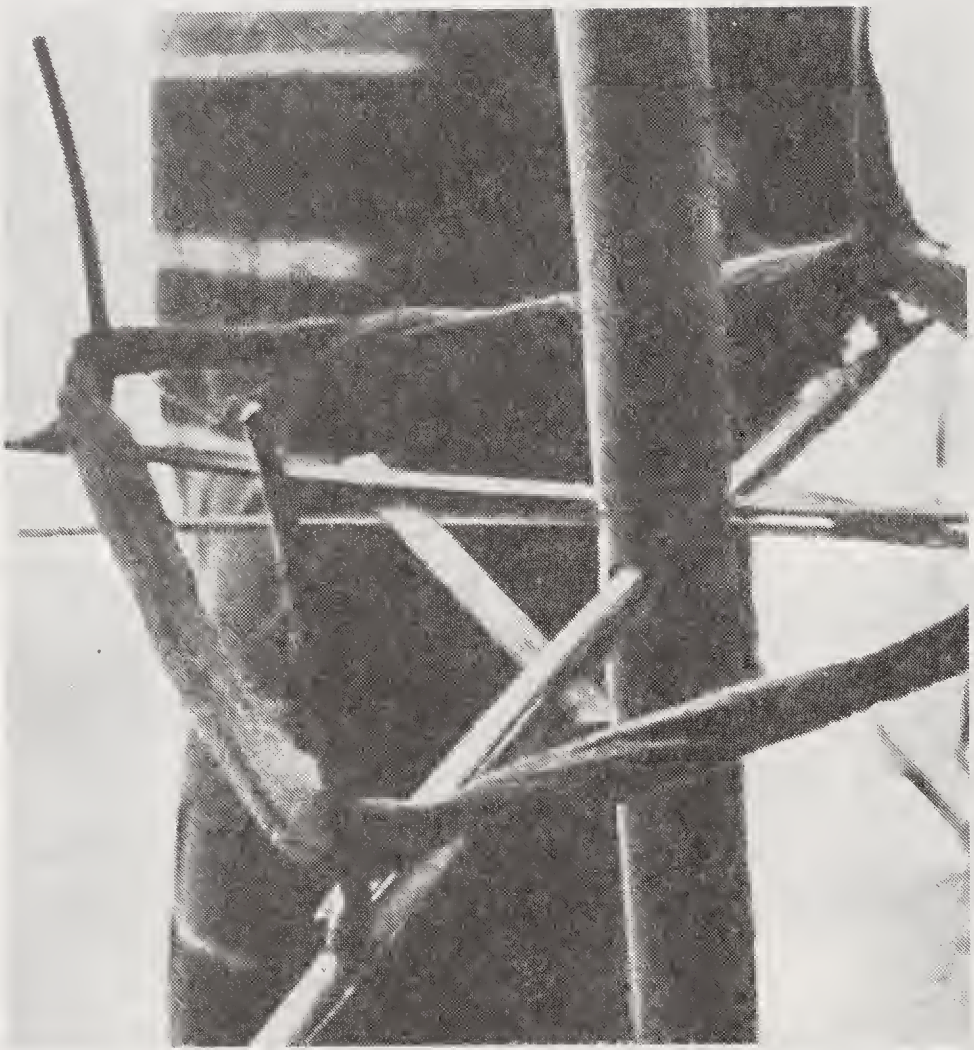
Wancho Bamboo Chain

The craftsmen in the training centre in Khonsa make long bamboo chains. Each interlocking link in the chain is a braided bamboo ring. These chains are cut to required lengths and used to make room dividing screens. Originally finer chains, where each link is a unit, was used to help work out simple arithmetic functions. The Wancho women make grass necklaces using the same technique. These are extremely fine with each ring measuring 2 to 3 mm in diameter (fig. 768).

769: A detail of the bamboo hank winder from Mizoram.

770: Bamboo hank-winder in use.

771: Bamboo mats used for partitions and walls in Manipur.



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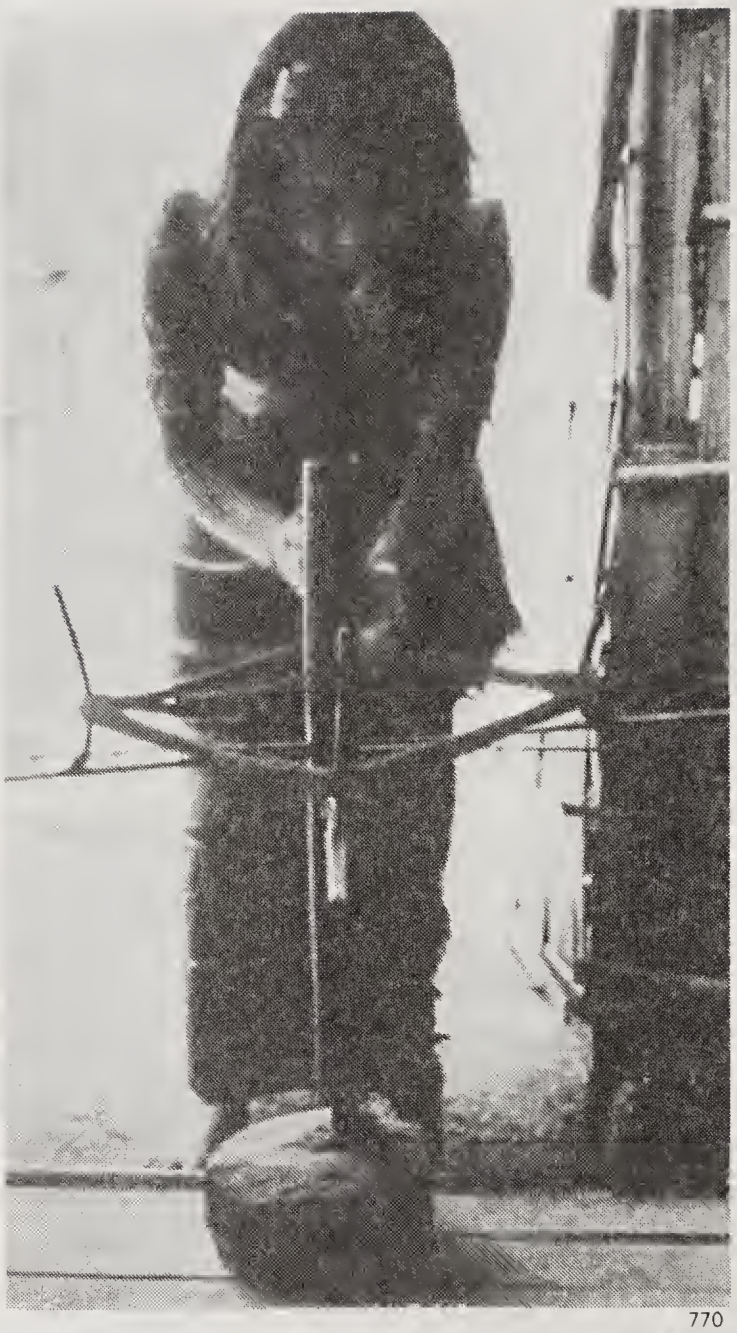

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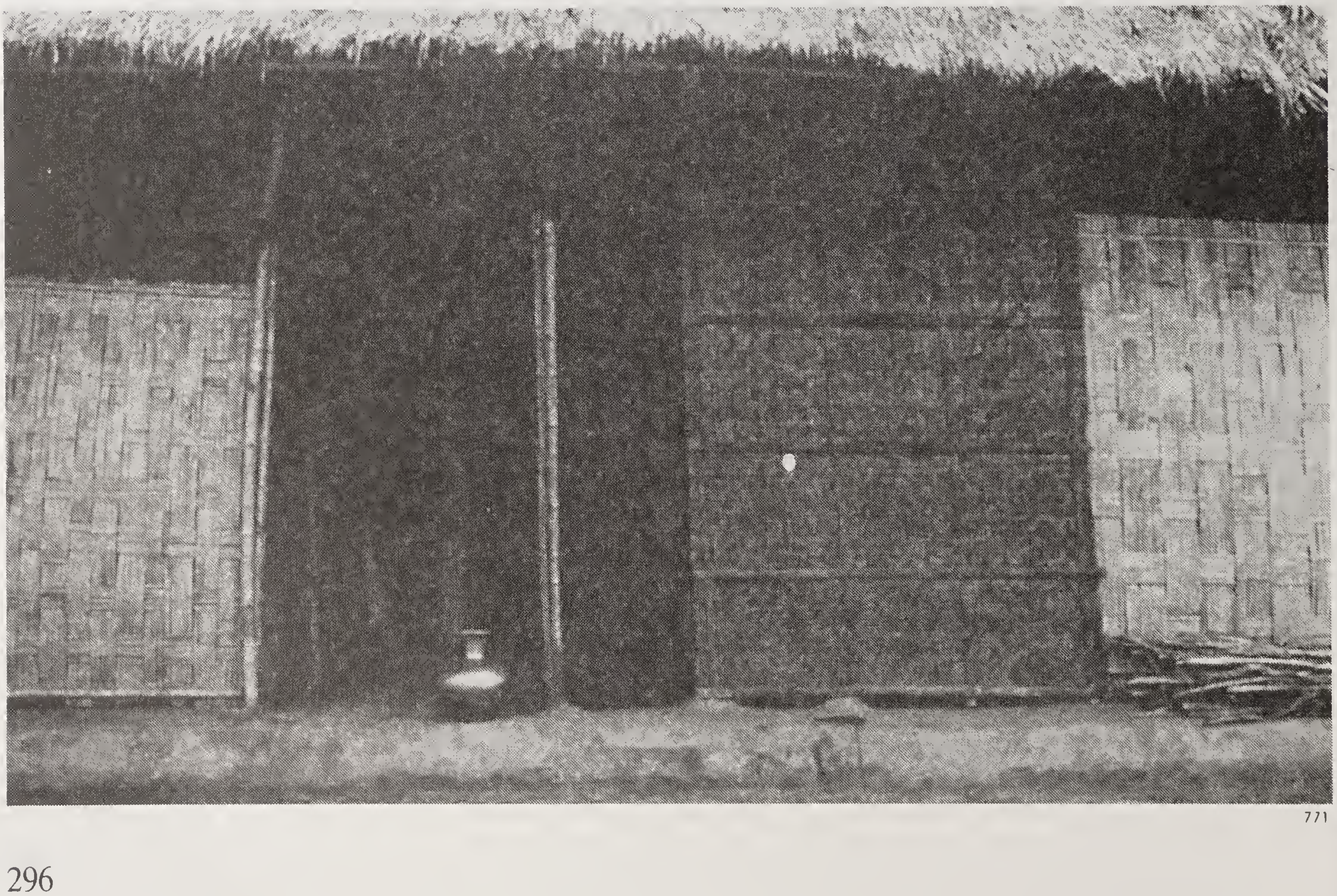

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Weaving Tools and Accessories

The loin-loom used in the northeastern region is made almost entirely of bamboo. It consists of several whole-bamboo elements both holding and separating the warp threads. The back-strap is made either from a braided split-cane belt or from leather. The beater is made from a stout piece of palm wood. Several types of shuttle made from bamboo are used here. Other accessories include a bamboo hank-winder and an assortment of baskets used to store yarn.

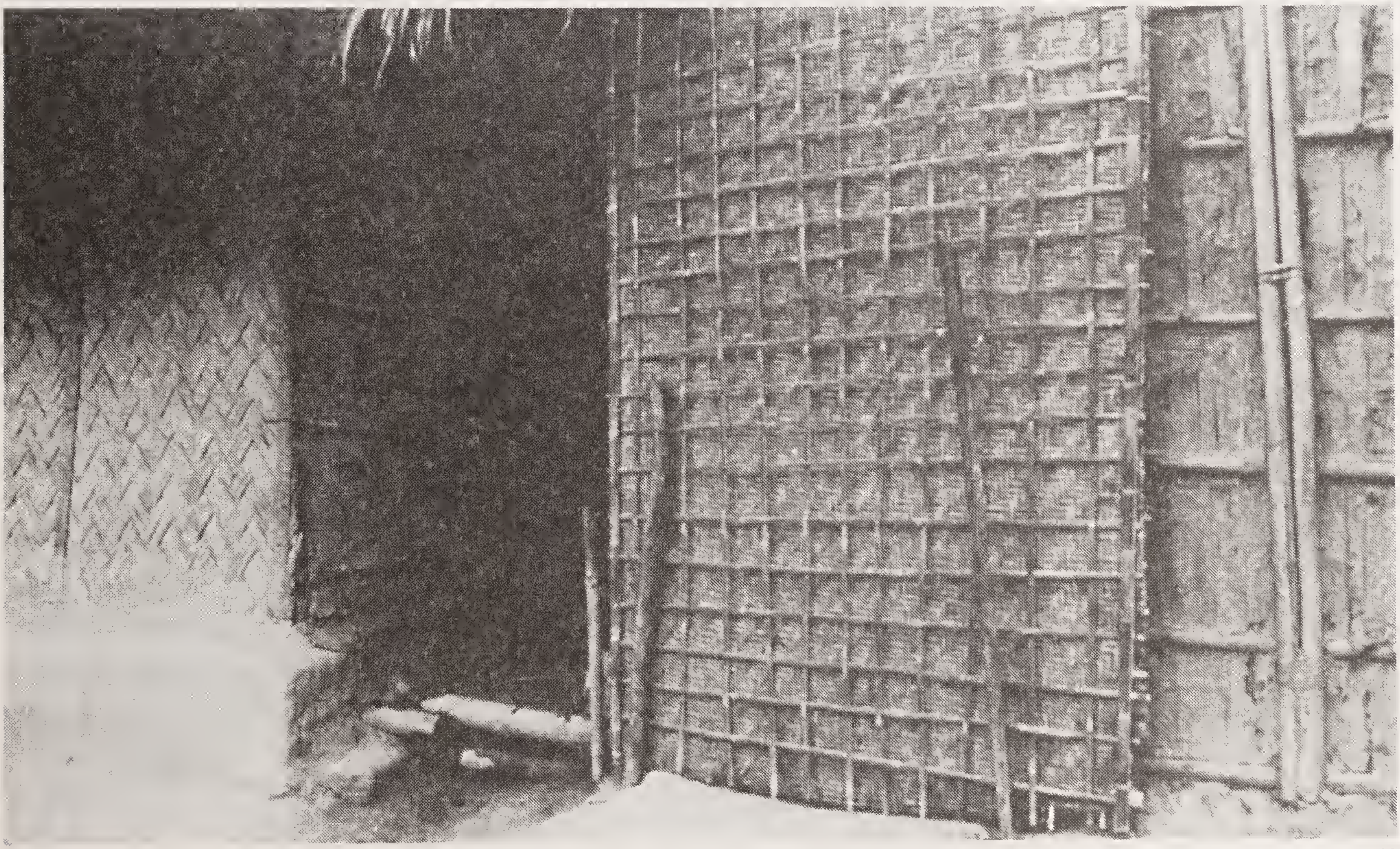
A hank-winder seen in Mizoram had an interesting construction (figs. 769, 770). It is fabricated from bamboo and has a wooden base. A whole bamboo column swivels axially around a pivot at the base. Four spokes of split bamboo with branch segments attached to each one are housed in the column to form a cross near the top. Pairs of opposite spokes are housed in the same hole and these holes form two mutually perpendicular axis which are staggered slightly in the height. Each pair of spokes overlap in the housed joint and can be adjusted to vary the diameter of the hank-winder before being wedged in place.

Other components made from bamboo include shuttles, spindles and pick-up sticks.

Woven and Plaited Bamboo Mats

In addition to the flattened bamboo mats made at Badarpur Ghat, a wide range of bamboo mats are made from bamboo splits. Several of these are used in house construction while others are used as floor mats for sleeping on or as surfaces for drying and processing grains (figs. 771-776).

772: Bamboo mats used for partitions and walls in Tripura.



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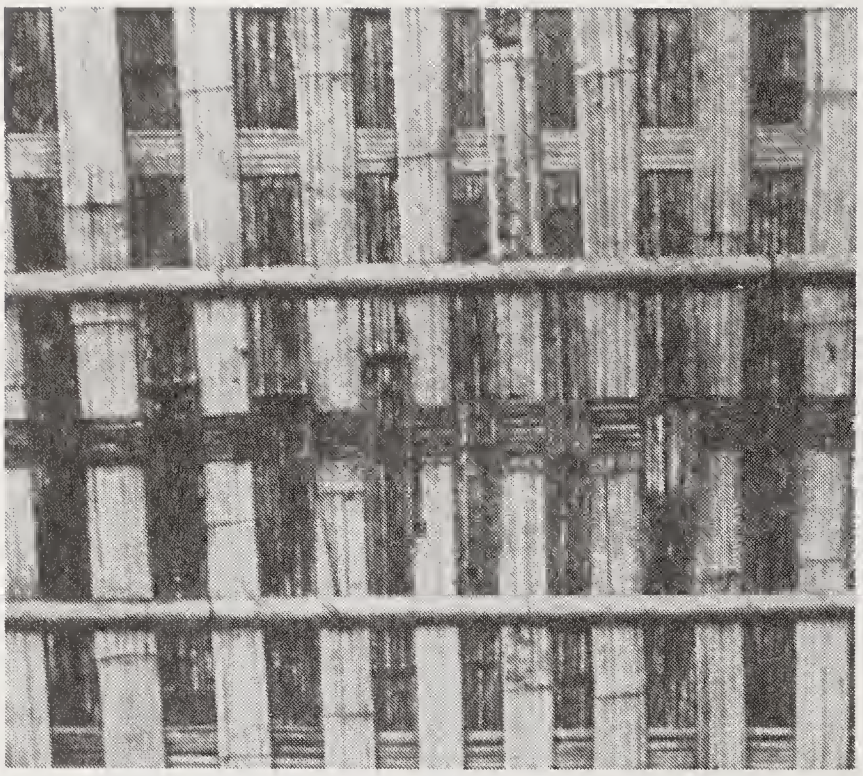

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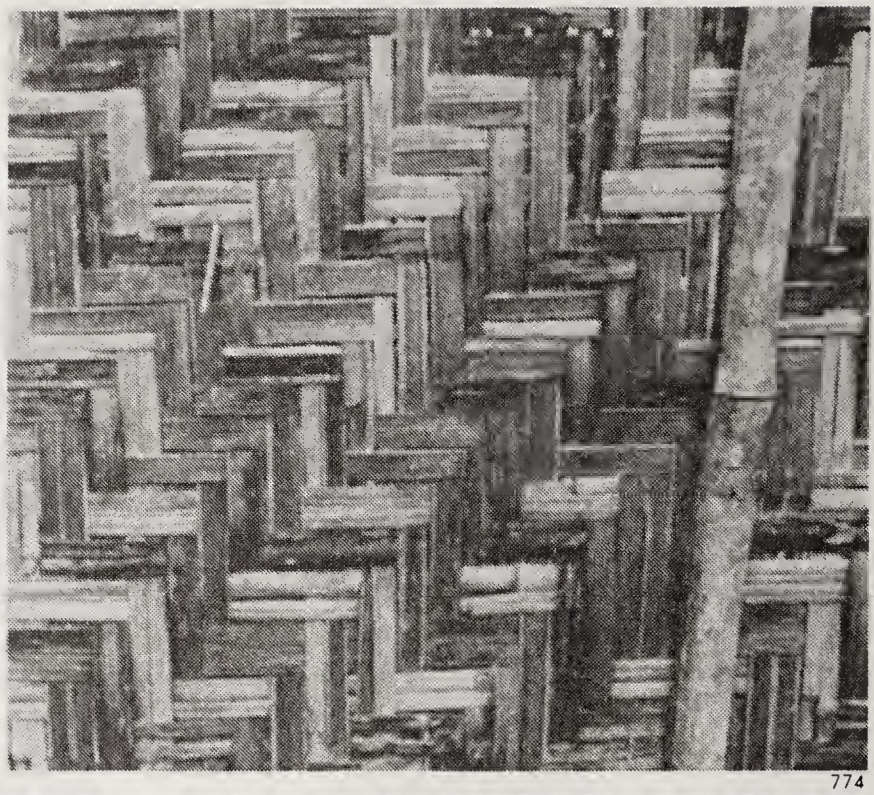

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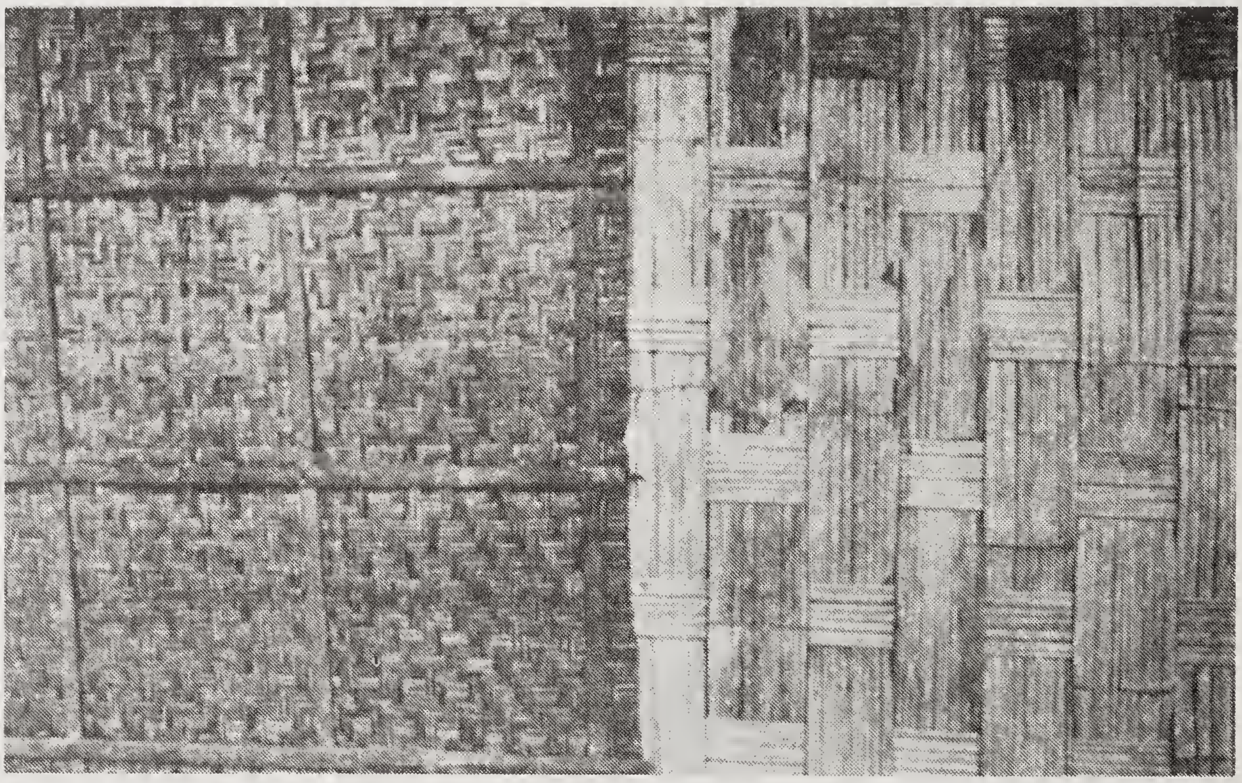
773: Detail of mat from Manipur.

774: Detail of mat woven from bamboo splits.

775: Flattened bamboo mat from Tripura.

776: Flattened bamboo mat in twill weave used for house and fence construction in Tripura.



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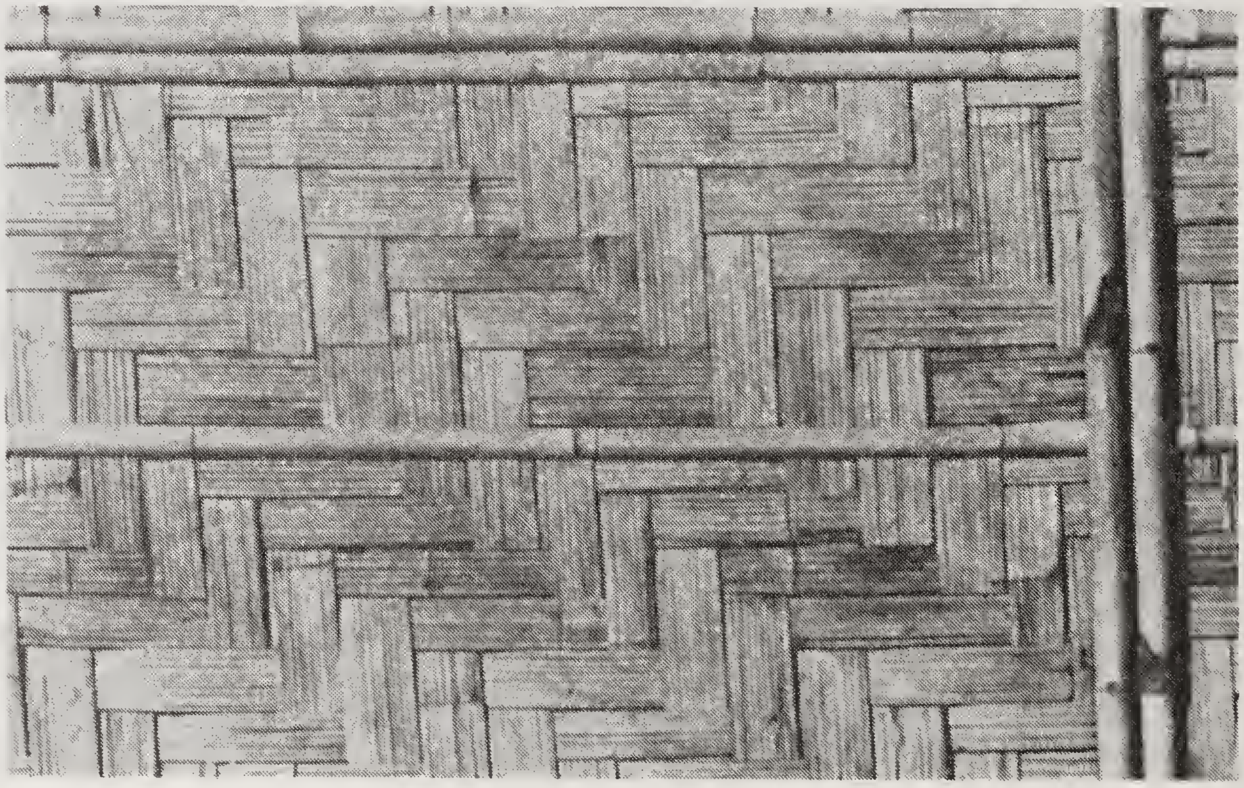

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777: A *navaslao*, Dimasa Cachari sleeping mat.

Dimasa Cachari Bamboo Mats

The Dimasa Cacharis make sleeping mats from extremely fine bamboo splits. These are locally called *navaslao* (fig. 777). These mats are plaited in a delicate construction and in most cases have figures or geometric pattern on the surface. In some cases, selected splits are dyed a deep magenta to accentuate the pattern. The mats are woven from a bamboo locally called *waiyung,* which is as a rule harvested before it is two years old. The layer just below the outer surface of the bamboo is used in the splits.

The Dimasa Cacharis use another mat called *yamalang* for drying grain. Here relatively coarse splits are used and they are woven in a plain twill pattern.

Bamboo Mats of Manipur

Mats woven from bamboo splits in a range of constructions are used in house and fence construction in Manipur. The flattened bamboo mat similar to the ones made at Badarpur Ghat and elsewhere are locally called *wachet phak*. Here *wa* is the local name for any bamboo, *chet* means broken and *phak* is the local name for any mat. These mats are woven from mechanically-flattened whole culms of a bamboo locally known as *moubiwa* (*Melocana baciferra*).

Other bamboo mats are made from splits 15 to 25 mm in width. These are used in wall construction, partition screens and in false ceiling construction. In addition to these a species of reed bamboo is split and converted into woven mats. These mats are called *yengthouphak*. These are floor mats made from a thin-walled, small-diameter reed bamboo called *yengthou*. The mats are used for fencing, walls, ceilings and floor covering.

The *yengthouphak* has a role in cleaning, drying and threshing paddy. It is woven in large sizes ranging from 2.5 by 4.5 metres to 5 by 8 metres. These mats are rolled tight and transported on bullock carts to the fields to be spread out on the ground for threshing paddy. They have a smooth rich yellow surface and the colour and texture of the mats are enhanced by use.

Other Bamboo Mats

Almost all tribes in the northeastern region weave bamboo mats to serve various functions. The weave structures used are similar though the local names in each case varies.

Future Directions

Development Strategy

In the foregoing pages we have seen that the skill of working with bamboo is extremely widespread, with a large percentage of the ethnic population capable of refined craftsmanship in this material. Although for most craftsmen this is not an exclusive occupation, the distribution of skills and an understanding of the properties and limitations of the material is a valuable resource for the formation and expansion of a craft-based industry (fig. 778).

778

778: Professional basket makers at a bazaar in Assam.

The population of the northeastern states is composed of several different tribes and ethnic groups. Although similarities may be seen at the general level, a great many differences exist between tribes and sub-tribes in the manner in which they use bamboo and in the type of products made (fig. 779). Strategies evolved for the promotion of crafts in this region will need to recognise these differences.

Changing Scenario

So far, the northeastern region's immense repertory of product forms, skills, and techniques has been used largely to satisfy the day-to-day needs of local communities. However, great changes are taking place in response to an inexorable development process, threatening the very roots of cultural continuity. Increased communication, greater awareness through education, and the development process being greatly government-oriented is creating serious imbalances. There is a definite need to develop industrial entrepreneurship, to assist in the tasks of employment and income generation which are independent of direct government funding. However, sensitive government support would be essential in developing the necessary infrastructure. The craft strengths of the region offer an exciting and feasible starting point for the development of entrepreneurial attitudes essential for the overall development of the region.

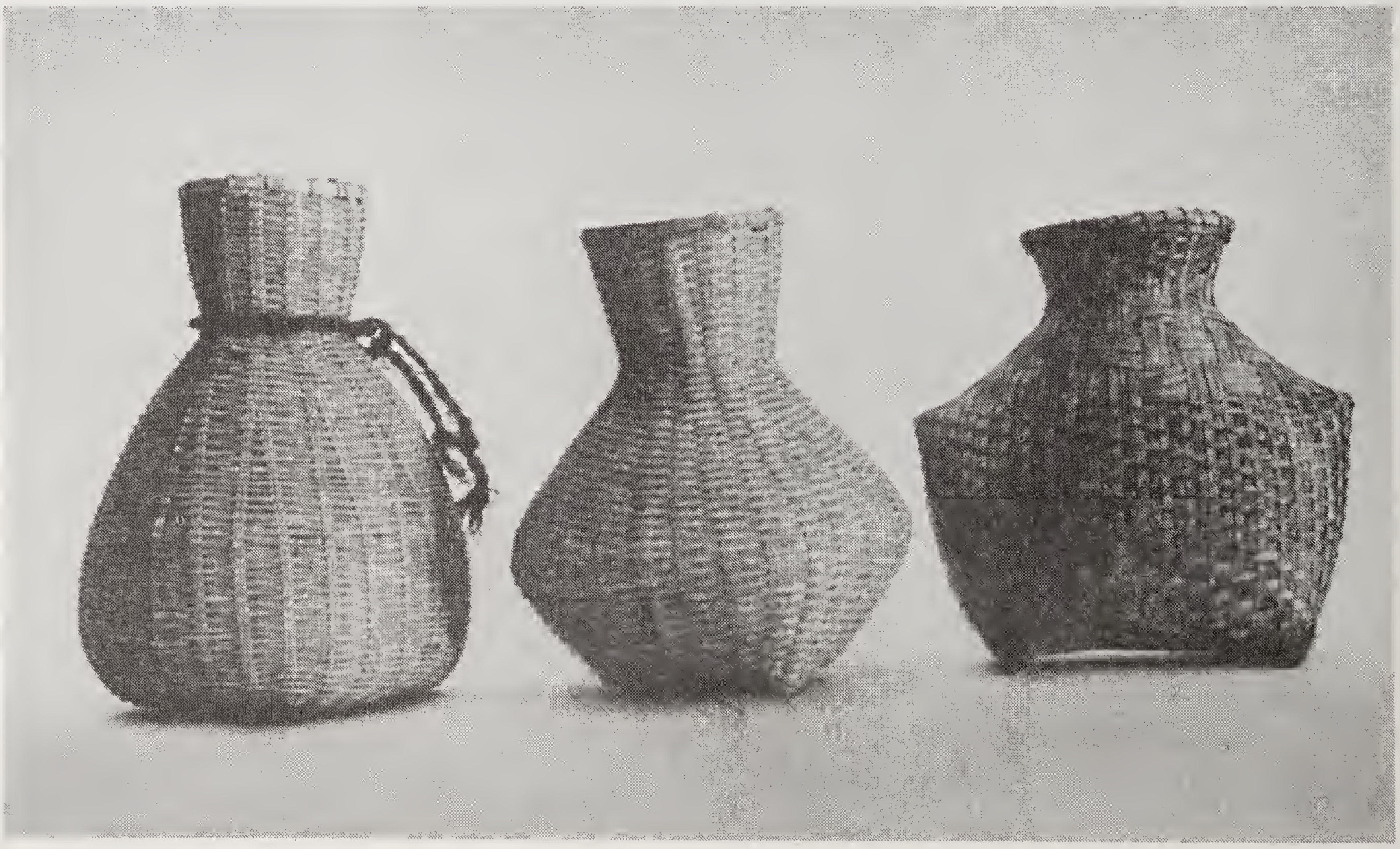
Existing Industry

There is a fairly well-established industry which supplies finished products to handicraft emporia in the metropolitan cities. This industry is distributed over several locations in Tripura, Assam, Meghalaya and Manipur. Most of these emporia-type products are sold as curios which are far removed from any functional context. Perhaps this factor has contributed to the degeneration in the aesthetic and structural quality standards of these products. An excessive preoccupation with decorative detail with no reference to material properties or traditional form is also responsible for this degeneration. It is painful to see such products being promoted by state corporations and government development agencies (figs. 780, 781). Perhaps the best strategy would be to help local craftsmen select the best examples from among the vast range of traditional products and help them see afresh their inherent strengths. Product diversification should be firmly rooted in the traditional wisdom expressed in these products if quality standards are to be maintained in the face of change caused by market pressure.

Development Strategy

Among the traditional products there are many that would find substantial markets outside the region if they are systematically exposed and promoted. Potential markets exist in urban centres in India for well-made trays and baskets which could be used in households as functional or storage

779: Three fish baskets from Tripura, Assam and Manipur. These exemplify the marked difference in form and structure in products used for identical purposes.



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containers. There is also a large market for authentic collectors items such as tribal products and basketry, which includes carrying and storage baskets, fish traps, headgear, smoking pipes, etc. The marketing of these products can be greatly enhanced if information relating to source, function, significance in tribal life, and other interesting features of each item are provided along with the product.

In addition, a range of new products could be developed based on simple modifications of existing types. One such product line could be architectural interior elements such as screens and partitions made from the split bamboo mats and flattened bamboo elements presently being used for house construction by tribal communities. Another product line could well be based on the exotic technique of heat flattening of bamboo into veneer-like sheets used to make storage containers. Several tribes in Manipur, Nagaland, Mizoram and Arunachal make flattened bamboo containers in a variety of shapes for storing and serving food. These could be extended to the production of contemporary products such as salad bowls, serving dishes, and trays intended for both urban upcountry and export markets. Similarly, other traditional techniques could be applied for generating a variety of contemporary products.

The suggested development strategy of extending traditional products for new applications is based on the assumption that it would prevent the rapid degeneration of quality control norms usually associated with the introduction of an alien product line. With the establishment of a continuously performing production and marketing infrastructure it would be possible to further diversify product lines. This would be linked to the introduction of improved tools and processes, limited mechanisation, and lamination with sophisticated adhesives. The possible new applications could be in the area of sports goods, toys and furniture, to name only a few. In this effort it would be worthwhile exploring the role of bamboo in substituting rapidly declining timber resources.

Problems

Notwithstanding the tremendous scope for the growth of bamboo handicrafts, today there are also many problems inhibiting its development. As already mentioned, entrepreneurial attitudes and skills need to be developed among local craftsmen. There is a serious lack of precise data on the structural and mechanical properties of various bamboo species. Although local craftsmen have an intuitive understanding of these properties, there is a need for such information to be externalised and classified in a scientific

780: An excessively decorated commercial handicraft product.

781: Another commercial handicraft product.

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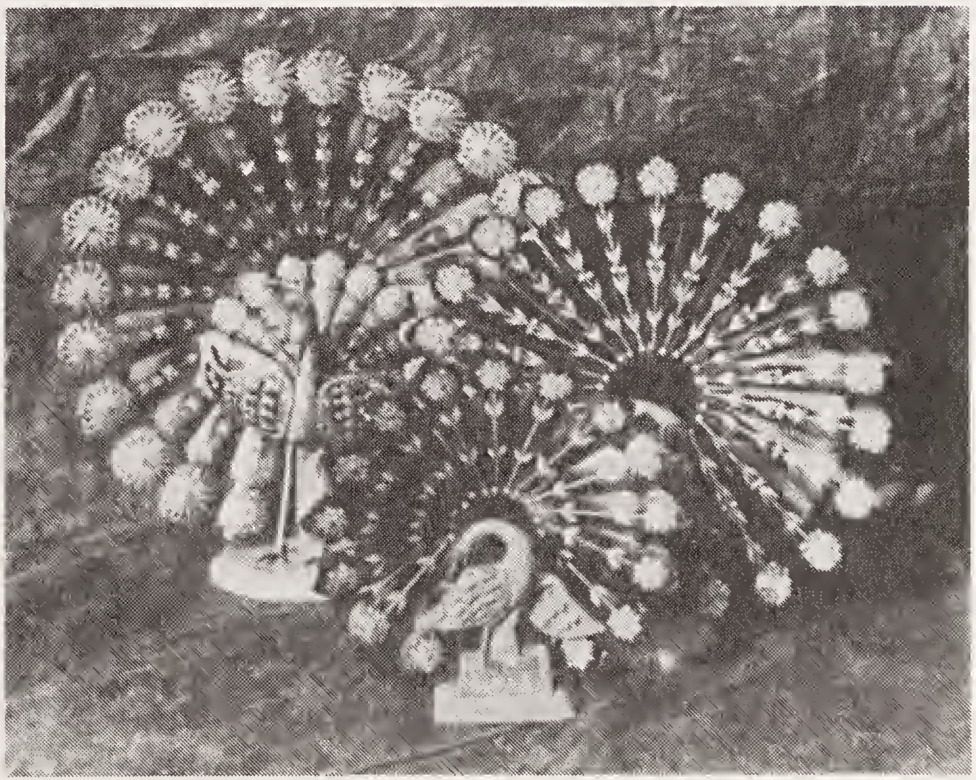

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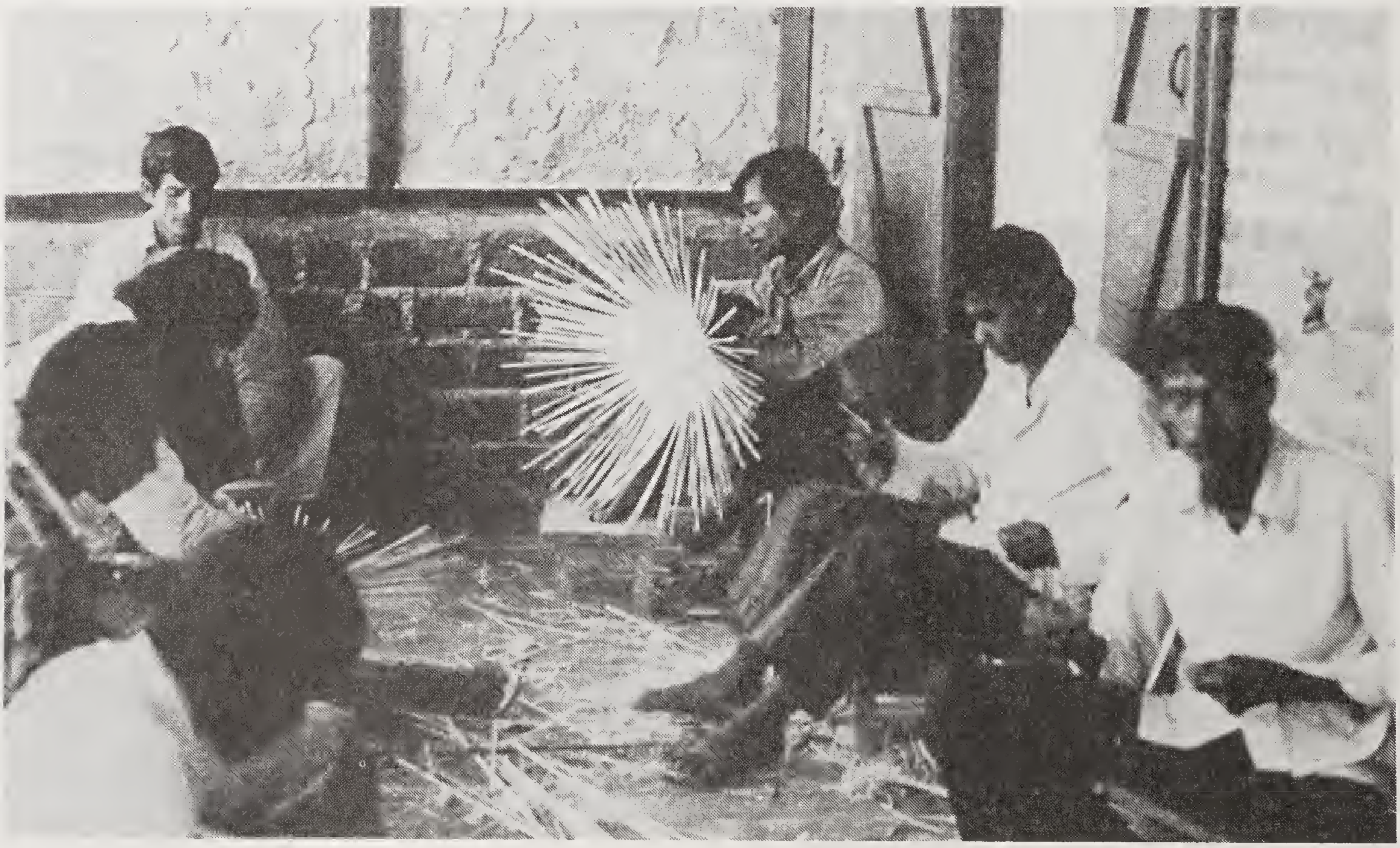
manner. There is also a lack of systematic botanical information on the growth and propagation of species suitable for handicrafts on a region-to-region basis. Bamboo handicrafts are usually bulky and relatively low priced. The existing volume-to-cost ratio attracts a disproportionately high transportation cost, especially due to the geographical and political location of the northeastern region. Bamboo is also extremely susceptible to attack by fungi, insects and borers. Traditional methods of preservation may not be adequate for bamboo handicrafts intended for new applications.

Development Infrastructure

To overcome these problems there is an urgent need to build up a coordinated research and development activity/infrastructure that is multi-disciplinary in nature. This research will need to include botanical, technical, design, marketing, managerial and economic aspects directly related to the craft. A considerable amount of information is available with several state and central government agencies such as the Forest Research Institute in Dehra Dun, Botanical Survey of India, Census of India, Anthropological Survey of India, State Forest Departments, Tribal Research Departments, and the Departments of Industries in the northeastern states. In addition, several leading educational institutions such as the Indian Institute of Science in Bangalore, the Indian Institutes of Management, the Indian Institutes of Technology, the National Institute of Design, and the Northeastern Hill University have undertaken projects directly relevant to this craft activity. All this information will need to be brought together and made accessible to field-level workers and craftsmen in the northeast. Further, the Office of the Development Commissioner for Handicrafts which is the apex body for the promotion of handicrafts in the country has set up several organisations to support the marketing of craft products, the training of young craftsmen, and extension services to craftsmen (fig. 782). The state governments too have their own infrastructure for craft promotion. These locally situated organisations have a great many people with considerable experience in dealing with local craftsmen and their problems.



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782: Craft training centre at Nalbari.

Hence the elements of supportive infrastructure for the development and promotion of crafts exist. All that is perhaps needed is a coordinated thrust towards clearly articulated objectives in the various spheres of activity related to this craft.

World Trade

A study on the imports of basketware which includes bamboo products—besides wicker, rattan, and products woven or plaited in other natural materials—indicates a substantial market size in countries such as the United States, the Federal Republic of Germany, Japan and France. The growth of imports over the five-year period 1974-79 is in the region of 150-200 per cent. Any future projection of market prospects for basketware remains positive, as imports should continue to benefit from an increasing consciousness and campaigns for natural materials and handicrafts. China is by far the most successful exporter of basketware, with well over 40 per cent of the market share in 1979. The developing countries of Asia, listed according to their level of export, include the Philippines, Taiwan, Hong Kong, the Republic of Korea, Thailand and Indonesia. It is surprising to note that India has no significant participation in this trade in spite of its massive raw material resources and its fantastic fund of traditional craft skills. Surely there is a lot that we can learn from our Asian neighbours in the areas of production and marketing basketware (fig. 783).

It will be difficult to enter the arena of world trade without first building up substantial experience in the commercial production and marketing of craft products within the country. As crafts communities in the Northeast need to gain this experience the initial thrust should be to develop products suitable for markets both within the region and other parts of the country. Experience gained from this effort would create the necessary confidence and skills to tackle enlarged markets at the international level.

Research Needs

As mentioned earlier, systematic research and development activity is urgently needed to create a sound footing as well as to provide continuing nourishment for the growth and prosperity of the craft activity. Among the botanical aspects that need attention are systematic identification of species and ecological studies on natural bamboo populations. This would be essential in order to ensure proper management policies of bamboo stocks growing under natural conditions. Studies and experiments in the cultivation of selected species both to promote forest regeneration and to fulfil social forestry schemes need to be considered.

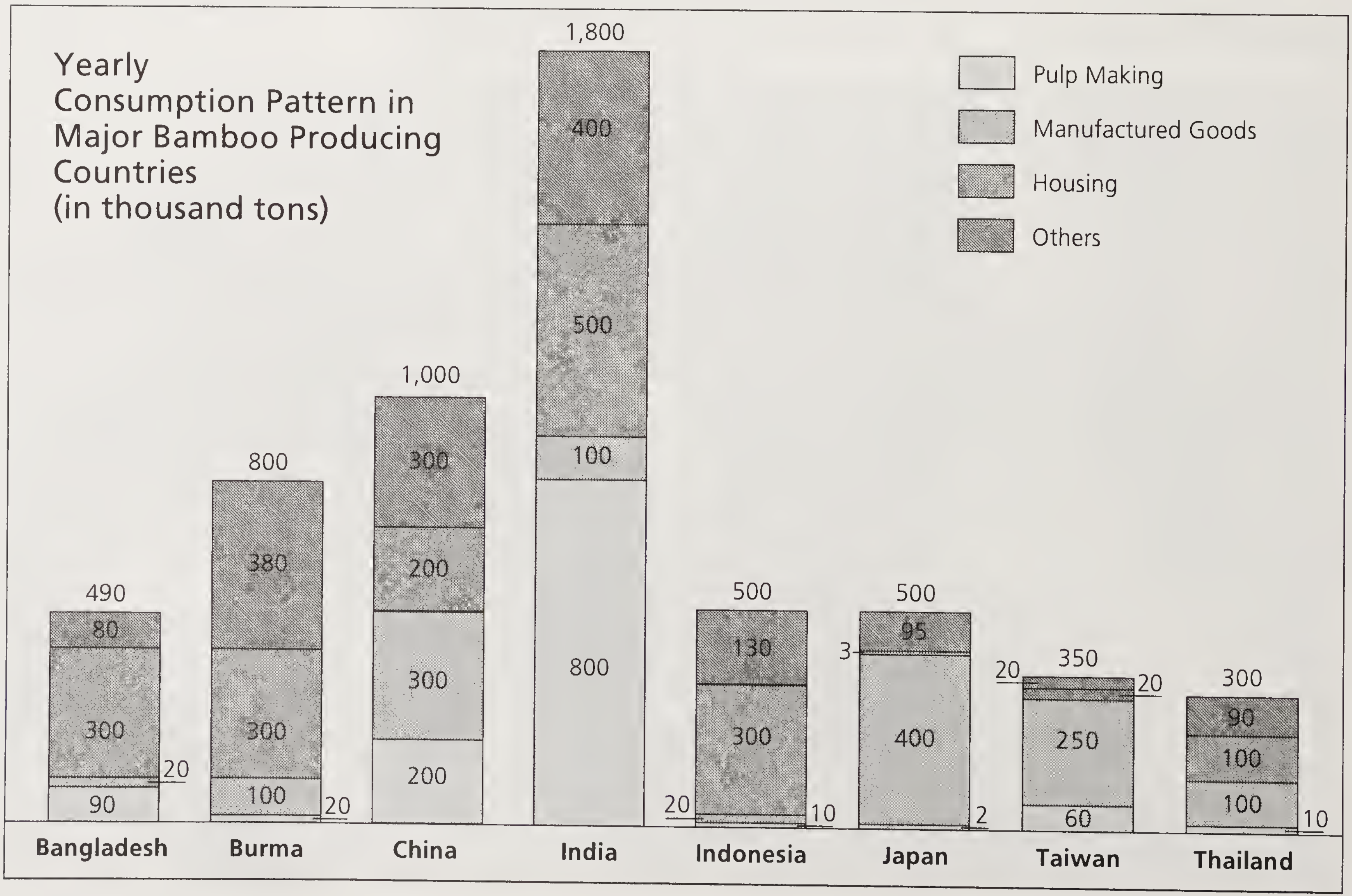
Comparative studies of different species locally available are essential, as differences among species of bamboo provide a wide spectrum of characteristics and properties that determine the best use of a given bamboo and the relative value of available kinds for a given purpose. These would provide data on the average dimensions of culm, taper or straightness of culms, length of internodes, and thickness of culm walls. Data on the relative proportions and distribution of fibres and tissues in each would in turn determine the density and strength of each bamboo, its splitting qualities, and its susceptibility to attack by fungi, insects and borers. Technical research is needed to determine appropriate methods of preservation and preservatives used for specific applications. The development of improved production tools and methods would need to continue simultaneously. Quality control could be improved by the introduction of simple jigs and fixtures to standardise size and form in production. Methods of material standardisation and consistent manufacturing procedures could be explored for the efficient use of skills; and in some sectors limited mechanisation, especially in splitting, sizing and finishing of the basic raw material, could reduce drudgery while increasing the earning potential of individual craftsmen.

Product development is needed primarily to solve transportation problems. Concepts could be explored of how to stack, nest and dismantle in various product categories. A wide range of new products could be developed which have functional value while being compatible with the level of sophistication of each craft community. In addition, explorations into the possible extension of local products for use outside the region could lead to the identification of several existing products which require to be vigorously promoted.

Needless to say these developments need to be brought to the field. Perhaps the best avenue would be the training institutions and centres set up in the region. Inputs provided by the existing training centres could be strengthened to ensure the overall growth of the young craft trainee so that, besides imparting craft skills, it leads to the creation of a whole generation of young entrepreneurs. Further, the task of promoting, managing and marketing this craft will provide professional opportunities for a host of other disciplines.

Competing Sectors

The craft sector is not the only user of bamboo. Traditionally, bamboo has been used for local construction and as fuel. Bamboo shoots provide food, besides a variety of rural applications. Today the pattern of consumption has changed to include pulp-making for paper and rayon production apart from applications in urban construction. The pattern of consumption in various Southeast Asian countries varies considerably from the pattern existing in India (fig. 783). These countries dominate the export of craft products whereas India has no significant contribution in this activity. In India paper and housing account for the bulk of bamboo consumption, while craft and manufactured goods absorb a much smaller quantity. China, Japan and Taiwan have a total consumption considerably lower than India's whereas their utilisation in craft and manufactured goods



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is far greater! The peculiar pattern of consumption of bamboo in India has brought along with it a major problem: that of overall and complete depletion of our bamboo resources in certain parts of the country.

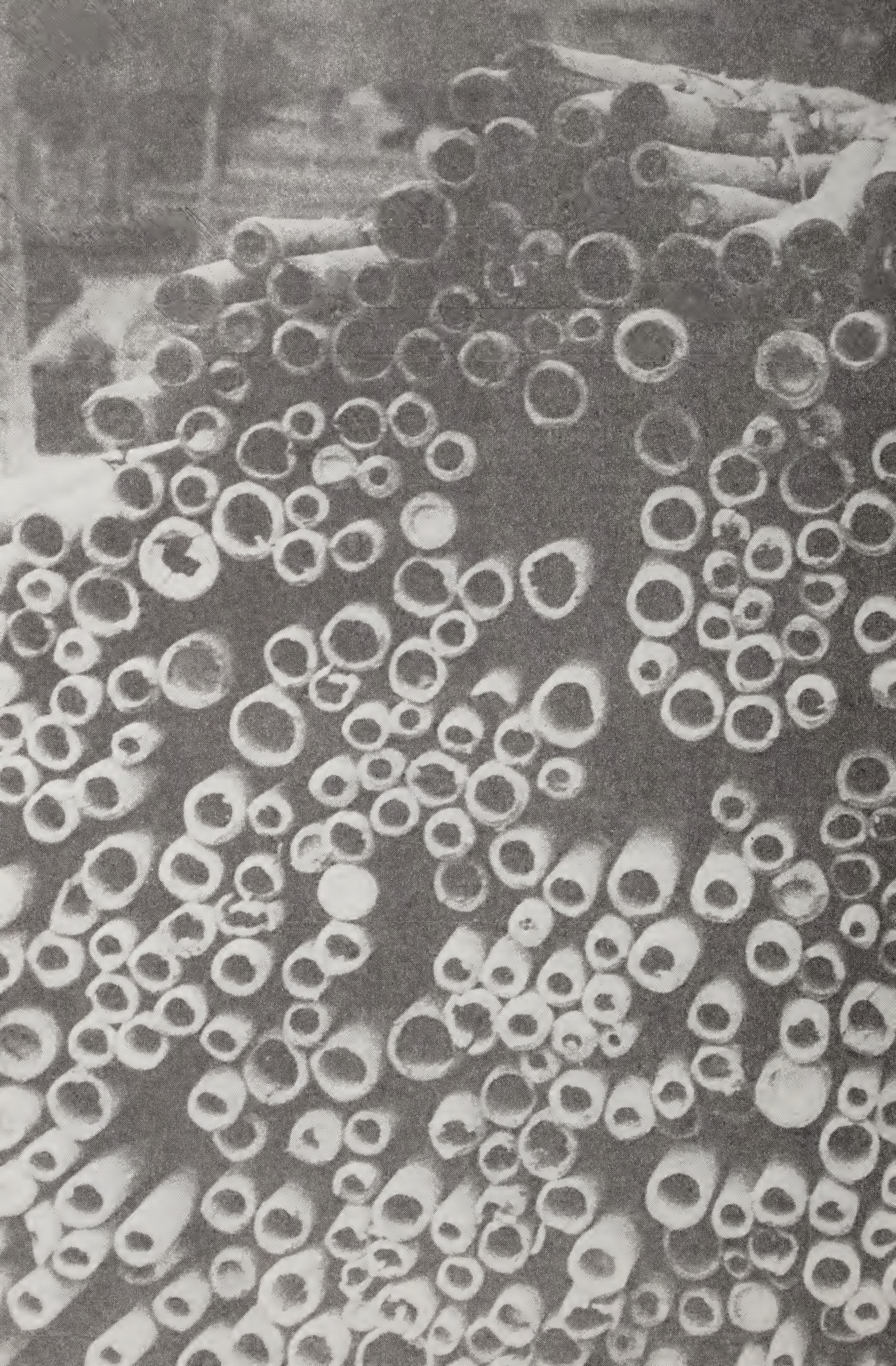
Historically, before the establishment in 1937 of paper mills using bamboo from forests in Karnataka (Mysore State), officials considered it a weed of teak plantations. Supplied at throwaway prices, bamboo has been exploited on a large scale for paper production, creating over the years serious imbalances in the local economy and ecology. These mills are at present drawing supplies from a much wider area than originally planned to include sources in Tamilnadu, Kerala, Madhya Pradesh, and as far away as Meghalaya. The only option open is to invest in raising plantations in order to stabilise availability. It is the rural user and the professional basket-makers who are the main sufferers as there is no way in which the role of bamboo in their lives can be replaced.

However, the pricing policy adopted does not encourage the cultivation of bamboo. Studies at the Indian Institute of Science, Bangalore, suggest that the current pricing of bamboo does not take into account the cost of replacing exhausted stock. Major industrial consumers have been supplied bamboo at ridiculously low prices, while rural and craft users have to obtain bamboo at prices often 20-80 times higher than those paid by industrial consumers. They have clearly established that a realistic pricing of bamboo would ensure profitability in cultivation comparable to other major cash crops.

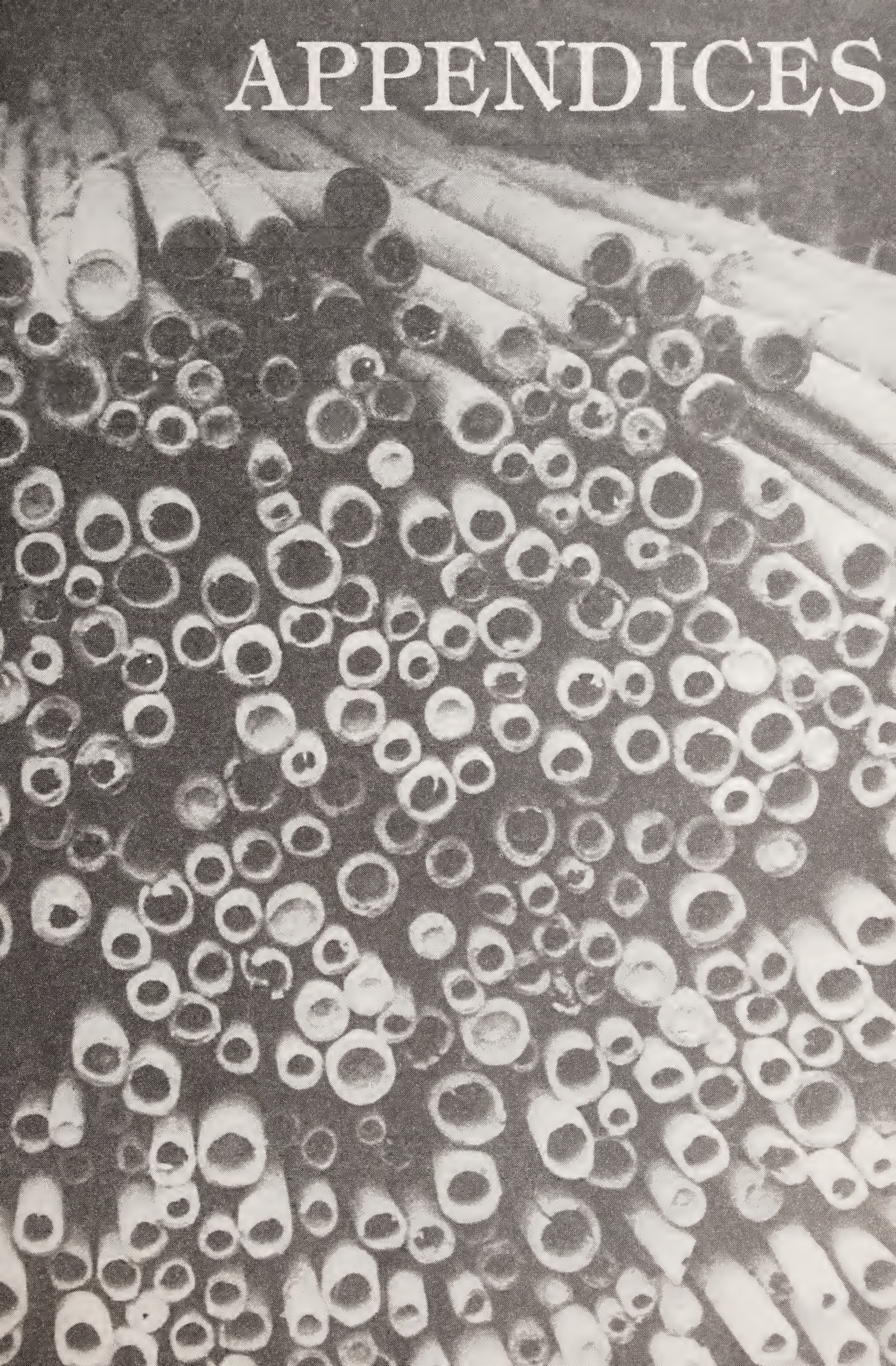
In the Northeast the industrial exploitation of bamboo commenced with the setting up of a paper mill in Nagaland. There are plans to open more such industries so that the abundant bamboo resources there are utilised. It is hoped that the lessons of the Karnataka experience will influence policies of forest management in the Northeast to permit overall growth and the co-existence of such competing sectors as the paper industry, craft and the rural consumer.

Conclusions

Having established that the Northeastern states possess an immense resource of standing bamboo stock as well as widespread distribution of sophisticated craft skills, one can see the possibility of a large decentralised industrial infrastructure growing in the region. As this craft-based industry depends on an easily renewable resource such as bamboo, cultural continuity could be maintained in the face of rapid change while ensuring the economic growth of the region. The potential to earn foreign exchange exists in large markets in the affluent Western countries. However, the actual realisation would have to wait until the production and marketing infrastructure is geared up while simultaneously developing markets inside India. This would need to be coordinated with research and development in the botanical, technical, design, marketing, management and economic aspects related to the craft. In addition, the existing conflict between competing sectors in the use of bamboo such as paper production, craft production and rural consumption needs to be resolved at the policy level to ensure the availability of bamboo as a truly renewable resource, a gift of nature to mankind. With the realisation of such prospects and problems, it is hoped that both policy makers and professionals will respond to the challenges in the growth of bamboo crafts.



APPENDICES



Appendix I

Bamboo: Propagation

Seeds

Very little work has been done on the propagation of bamboo in general. Different methods have been tried with different species, and generalisations are not possible.

The artificial propagation of bamboo through seeds poses various problems:

1. Seeds may not be easily available for many species of bamboo. This is due to the irregularity of flowering and consequent production of seeds. For bamboos that flower at long intervals, it is difficult to predict when the seeds will be available.
2. Experiments need to be carried out to find methods of preserving bamboo seeds. *Dendrocalamus strictus* seeds showed a sharp decrease in germinating capacity after they had been stored in controlled conditions for two years. So far it appears that fresh seeds if planted immediately give the best results.
3. Bamboo seeds tend to be heterogenous and the culms that grow out of them differ in some aspects like size and genetic constitution.

Vegetative Fractions

Vegetative propagation is used to overcome some of the difficulties of seed propagation. Various types of propagules are used, the merits of each differing with the type of bamboo. There are considered to be two groups of bamboo. Group I consists of caespitose bamboo with autumnal growth and facilled rhizome branches. Group II has *leptomorph* rhizomes and grows in spring. The propagules used are described briefly below.

Clump division is the most common traditional method of propagating bamboo. The simplest method is to divide the clump in half, keeping each part as intact as possible. If properly planted, this type of propagule has the highest degree of success, with the least care. The main problems are the size and availability of large numbers of such propagules. The other extreme of clump division is to use the lower part of one culm, complete with rhizome, as the propagule. These are called offsets. The advantages of offsets are the possibility of using material of the right age, economy of the plant and easier handling. However, offsets need more care than the larger clump divisions. It has been found that an offset comprising one two-year-old culm and a one-year-old culm gives good results. For offsets and small clump divisions, the age of the material is important.

Rhizome Propagation

This is believed to be the best means of propagating bamboo, but a lot more experimentation needs to be conducted. The size of the propagule is an advantage. The problems with rhizome propagules are a meagre formation of the anchoring roots, susceptibility to rot fungi and the slowness of the rhizome buds in breaking dormancy.

Clump divisions and rhizome propagules generally work as well for bamboos of both the groups mentioned earlier.

Whole Culm Propagules

This is a method whereby an entire culm, complete with basal root, is buried horizontally. Branch shoots are sent out of alternate nodes and these get stronger and bigger in proportion to the development of the roots, till they grow as the original culm. This method has been tried with bamboos of Group I. It has been seen that the age of the culm and its position in the clump has a bearing on the success of propagation by this method. Experiments carried out to propagate Group II bamboos by this method appear to have given negative results.

Culm Segments

Culm cuttings or segments are pieces of culm with usually two or more nodes with buds or branches. The leaves are removed and the propagule is usually set upright or at an angle with at least one node covered. The portion of the culm used and its age are important factors. The lower part of the culm generally has rootlets at the node. This method seems to work for some but not for all bamboos in Group I.

Some bamboos of Group II may be propagated in this manner if the basal portion or in some cases the underground portion of the culm is used.

Single Branch Propagules

Some species of bamboo in Group I have mid-culm branches which are swollen at the base. One specimen with a certain number of root primordia at the base of the branch produced results. This method has not produced results with bamboos in Group II.

Some species of bamboo do not propagate by seeds but by means of bulbils. These can be used for artificial propagation as well.

Propagation by Layering

Layering is the process by which the propagule is allowed to grow roots before it is severed from the mother plant. There are three ways in which this is done. A live culm is bent down towards the ground into a shallow trench and a portion of it is covered with a propagating medium until it develops roots. It is then treated like a culm cutting. This method can only be used for bamboos in Group I and is very cumbersome unless used for short varieties of bamboo.

Stumps of severed bamboo culms with one or two nodes and buds are covered with a propagating medium. The third method of layering is air layering, where the propagating medium is tied onto the culm at the node. This method works in the propagation of woody dicotyledons, but has been unsuccessful with bamboo. Much work remains to be done on the propagation of bamboo. The need for organised cultivation will grow as the demand for particular species increases.

Appendix II

Bamboo: Preservation

Following are methods of preservation of bamboo and various chemicals used in different processes. This material has been extracted from a note on bamboo preservation by Ashutosh Kumar, V. S. Shukla and Dipak Sen.

Traditional Methods

Precautions against borer and insect attack on bamboo can be taken at the time the bamboo is felled. The felling period itself is important. The growing period of the culms starts just before the monsoons, corresponding to the month of February in the northeast and continues until about September. After this, the growth decreases so that the lean period is October to January. During this time the starch and sugar content in the culm is at its lowest, thus making it unattractive to insects. This is, therefore, the best time to fell the bamboo.

The cut culms are stored vertically, complete with leaves and branches. Within a few days some of the starch and sugar is digested by the culm, and the sap and moisture is drawn upwards through the vessels, to evaporate from the underside of the leaves. The culms are stored vertically because the drawing force is strongest in this position. This, then, is the first step towards preserving the culms.

Leaching and coating are the commonest traditional methods of protecting the culms against borer and insect attack.

Leaching

This is the process of replacing the starch and sugar in the bamboo by water. Freshly-cut culms are immersed in water for a period ranging from three days to three months. Partially-dry culms require soaking for an additional fortnight. Soaking in flowing water results in the most desirable leaching, as stagnant water may stain the culms. Sea water can be used only if marine borers are not present in it.

Traditional Japanese craftsmen preserve bamboo strips and portions of culm by boiling them in water or in a caustic soda solution. The strips are boiled in water for about 15 minutes, thus removing some of the soluble starches and sugars. Two or three repetitions of the process produce better results. If caustic soda is used, the bamboo must be boiled in a solution of 0.5 to 1 per cent of sodium carbonate or caustic soda for 5 to 30 minutes.

Both these methods improve resistance to borer and insect attack, but do not affect the growth of fungus. Besides, the strength of the bamboo is reduced, and it turns from pale to deep yellow in colour.

Coating

A coat of lime, tar, a combination of the two, or tar with a sprinkling of sand is applied to all cut surfaces, abrasions, slits and exposed internodes. This only affords external protection, as it is difficult to protect the inner walls of the internodes by this method.

Chemical Classification of Preservatives

The preservatives used for bamboo may be broadly classified as oil-based, water-soluble and leachable, water-soluble and non-leachable, and those used with organic solvents.

Oil-Based Preservatives

Including various forms of creosote, these are not suitable for handicraft products because they have an odour, they discolour the bamboo and cause it to bleed. It is not possible to paint or varnish bamboo treated with these preservatives.

Leachable Water-Soluble Preservatives

These are made of water-soluble organic or inorganic salts like zinc chloride, zinc sulphate, copper sulphate, boric acid, borax, sodium flouride, arsenic trioxide, arsenic pentaoxide and sodium pentachlorophenate which are easy to transport. With the exception of sodium pentachlorophenate, the other preservatives are odourless. Products treated with any of these can be painted or varnished after treatment. The leaching of preservatives can be prevented by the application of waterproof coating.

Non-Leachable Water-Soluble Preservatives

These preservatives are a mixture of one of the water-soluble salts mentioned earlier and a fixative salt, which is usually sodium or potassium dichromate. The chormium fixes the toxic ions of arsenic, copper, zinc, etc. in the bamboo so that they cannot be easily leached by water. The preservatives are generally used cold, because the use of a hot preservative may cause undesirable chemical reactions.

Organic-Solvent Preservatives

These consist of copper and zinc salts of organic acids such as naphthenic acid, stearic acid and abietic acid, and chlorinated phenols and benzene like pentachlorophenol, dieldrin, benzene hexachloride and DDT. The salts are dissolved in suitable organic solvents with low boiling points, like solvent naphthos, kerosene or white spirit. When the treated bamboo dries, the solvent evaporates, leaving the preservative in the bamboo. Since these preservatives are insoluble in water, they are unleachable and permanent. Some of the solvents are inflammable, and need to be used cold and handled carefully. The surface of the treated bamboo can be painted and varnished.

Methods of Application

There are basically two methods of treatment, those that do not require external pressure to induce them into the material, and those that need a pump or some other additional pressure. The former are easy to carry out but the latter require special apparatus.

Surface application, dipping, diffusion, steeping, kyanising, cold soaking and the hot and cold bath processes fall into the non-pressure category, while the full-cell, empty-cell, Rueping Lowry, Boulton, Colton and modified Boucherie processes are in the category of pressure treatments. Of all these, the ones most effective for cane and bamboo handicrafts are recommended by the Bamboo and Cane Development Institute at Agartala. These are described in detail:

Prophylactic or Surface Application

This is the simplest method, where the preservative is brushed or sprayed onto the material. It is, however, also the least efficient method and is, therefore, used only where other methods are not practicable. It is mainly used in the handicrafts industry to treat finished products. Due to the inefficiency of this method, toxic and highly penetrative preservatives (such as the one mentioned below) are recommended.

Boric Acid and Borax

A five per cent aqueous solution is made by dissolving 2.5 grams of boric acid and 2.5 grams of borax in 100 cc of water. This mixture does not injure or pose a health problem for people, and is, therefore, the only preservative that can safely be used for the treatment of products coming into direct contact with food. It is effective against borers, but has a low resistance to fungus.

Dipping

This is the process of submerging the bamboo in the preservative for a given period of time. A vat or tank is filled with the preservative, and the pieces of bamboo are entirely submerged in it. Bamboo splits require a much shorter period of dipping than dry whole bamboos, which can also be treated by this method. (The preservatives recommended for this process, particularly for handicraft products, are mentioned below).

Boric acid and borax—This is the same solution that is used for the surface application process, and it has similar results. The strips of bamboo and whole culms are submerged for a period of one to 10 days, depending on the size of the pieces. The preservative is leachable, and therefore strips of bamboo treated in this manner should not be soaked too long in water prior to making the end product. Small handicraft products can also be dip-treated, if care is taken to protect the glued joints.

Copper-chrome-boric mixture—This is a six to eight per cent aqueous solution made from a mixture of 1½ parts of boric acid, 3 parts of copper sulphate and 4 parts of sodium or potassium dichromate. It prevents mould and insect attack effectively, but the copper salt is toxic, and therefore cannot be used for food containers. It also tends to give the material a greenish tinge, and thus affects products where the colour of the bamboo is of importance.

Zinc chloride and chromated zinc chloride—Zinc chloride has been used as a preservative since 1830. However, it has a number of drawbacks. It is only moderately effective even when used in high concentrations. It is totally ineffective against some moulds such as *Aspergillus*. It is soluble in water and therefore easily leachable. This characteristic can be countered by the addition of a fixative salt such as sodium or potassium dichromate, which turns the preservative into chromated zinc chloride. However, both these preservatives impair the natural sheen and colour of the bamboo.

Sodium pentachlorophenate—As mentioned earlier, this preservative is also used for surface application. It is a very effective preservative, but needs careful handling. Fine strips of cane and bamboo are dipped into a 0.5 to one per cent aqueous solution for six to eight hours. The dipping time can be reduced to 15 minutes to one hour if the strips are boiled in the solution.

Steeping or Diffusion

Steeping or diffusion is very similar to the dipping process, the main difference being that steeping is generally used to treat green bamboo and cane. The chemicals used here are similar to those used for the brush, spray and dipping processes. Steeping is the simplest and most economical process, causing a minimum waste of the preservative. The main drawback of the process is the long period required for treatment. Freshly-felled culms need upto five weeks in the solution, depending on the age, species and thickness of the culm and the degree of absorption required. A longer period of soaking is required for culms that are to be used in contact with the ground. The treatment is more effective if the nodal walls of the bamboo are punctured with an auger.

Split bamboo requires one-third to half the time required for whole culms, and the penetration can be 100 per cent. If the outer skin is ruptured, or if hot solutions are used, the period of treatment is shorter. The rate of diffusion of the preservative varies with the species of bamboo. Whole green canes are also effectively treated by this method. Cane needs one to two weeks in the boric-borax solution, and three weeks in a zinc chloride solution.

The processes of dipping, steeping and diffusion are very simple and can be easily followed by an unskilled person once the process and composition of the preservative has been clearly charted.

Boucherie Method

For the treatment of a few culms at a time, the original Boucherie method, better known as the steeping method, is used. Freshly-cut culms, complete with branches and leaves, are made to stand in a container with 30 to 60 cm of preservatives. The solution is drawn up through the culm due to transpiration of moisture from the leaves. The period of treatment varies from one to two weeks depending on the species, length of culm, climatic conditions, and the preservative used.

In the normal boucherie process, the preservative is pushed into the stems by the force of gravity. The culms are attached by pipes to a container placed at a height of about 10 metres. A small hand pump can be used to improve the process by pressuring the preservative contained in a tank placed on the ground. The higher pressure reduces the period of treatment.

Capping

This is an adaptation of the Boucherie method. A length of bicycle tube, or the inner tube of a car tyre is slipped over the butt-end of the bamboo, where it is secured with thread. The preservative solution is poured into the tube, which serves as a reservoir. The culm is then kept inclined, with its butt-end upwards. A basal internode of the culm may also be used as the reservoir, if a cut is made in the inner wall of the bamboo to facilitate penetration of the solution.

Modified Boucherie Process

The Boucherie method can be modified to use a pump to create the air pressure that forces the preservative through the bamboo. A tank, two-thirds full of preservative solution, is placed on the ground, and a hand pump is used to raise the pressure on the solution to between 1 and 1.4 kg/cm^2. Bamboo culms, freshly-felled and complete with leaves, are connected to the taps at the base of the tank by means of a rubber tube tied over the top of each culm. The pressurised preservative gradually forces the sap out of the culm, thus replacing it. The process is more effective if fresh water is first used to flush out the sap, soluble starches and sugars, before the preservative is infused in the culm. For the best results with this process, the culms should be cut when full of sap and over-mature culms should not be used. This method can be designed to handle over 500 culms simultaneously. The equipment required is simple and can be easily transported, so that the treatment of the culms can be carried out in the forest.

Pressure Treatments

Dry, green bamboo with a moisture content of less than 20 per cent can be effectively treated by pressure methods. To make the process more efficient, the nodal walls must first be bored with an auger. This also prevents the bamboo from cracking due to the pressure of the preservative.

The full-cell and Lowry pressure treatments used for timber are also used for bamboo. Absorption by these pressure methods is equivalent to that obtained by soaking the bamboo in preservative for one week. However, five weeks of soaking is 1½ times to twice as effective as the pressure methods.

Hot and Cold Process

When pressure impregnation facilities are not available, the hot and cold bath or open-tank method similar to that used for timber may be used for air-dried bamboo. The nodal walls are bored through to prevent the culm walls from cracking. The culm is submerged in a tank of preservative that is heated, either directly over a fire, or through steam coils in the tank. The temperature of the bath is raised to about 90°C, held there for the required period, and then allowed to cool.

The fixed type of preservative may precipitate on heating. To prevent this, the bamboo is rapidly heated in water and then dropped into the tank containing cold preservative solution.

For certain types of preservatives like pentachlorophenol, water cannot be used and the bamboo must be heated in some other suitable liquid before being transferred to the preservative.

Fire-Retardant Treatment

This is especially necessary for bamboo used for building purposes. A separate treatment for fire resistance is too expensive in relation to the cost of houses built from bamboo, and it is therefore worthwhile to combine the fire-resistant and preservative treatments. This is done with a solution of 3 parts ammonium phosphate, 3 parts boric acid, 1 part copper sulphate, 5 parts zinc chloride, 3 parts sodium dichromate and upto 100 parts water. A few drops of hydrochloric acid helps to dissolve the precipitated salts.

Appendix III

Bamboo: Local Names

The information collected from local craftsmen about the characteristics and uses of various species of locally available bamboo is listed below:

Aije/Ajee: Arunachal Pradesh, Tribe Adi Gallong
A bamboo about 85 to 90 mm in diameter, and internodes 600 mm long.

Aing/Eng: Nagaland, Tribe Chang
Used for the walls of houses.

Aipo/Oppyo: Arunachal Pradesh, Tribe Adi Gallong
A bamboo 150 to 200 mm in diameter. The splits are very brittle.

Aiyung: Nagaland, Tribe Chang
A deep green bamboo, about 35 to 40 mm in diameter, with internodes 1,000 to 1,200 mm long. It is very flexible as splits, and is used to make baskets.

Ajaw: Arunachal Pradesh, Tribe Adi Gallong
A bamboo 75 to 100 mm in diameter, with internodes 450 to 600 mm long. It is a heavy bamboo, used for the posts of houses.

Anu: Arunachal Pradesh, Tribe Adi Gallong
A large-diameter bamboo, with internodes 760 mm long. Used in fine splits to make baskets.

Assi: Arunachal Pradesh, Tribe Adi Gallong

Barak: Assam, Tripura
A large-diameter bamboo used for turned bamboo products.

Bholuka: Assam
A large-diameter bamboo.

Bije: Arunachal Pradesh, Tribe Apa Tani
The bamboo is 50 to 65 mm in diameter, with internodes 300 to 350 mm long. It has a *leptomorph* rhizome, and is cultivated in groves by the Apa Tanis at Ziro. The shoots are eaten, and the bamboo is used for a number of purposes by the people who cultivate it.

Chyu: Nagaland, Tribe Khiamngan
A reed bamboo that grows in cold climates in hilly forests. It is about 6 mm to 12.5 mm in diameter, has internodes about 300 to 450 mm long and needs support as it grows. It is used in ceremonial hats after it has been dyed red.

Esso: Arunachal Pradesh, Tribe Adi Gallong
A bamboo 75 to 100 mm in diameter with internodes 450 to 600 mm long. The splits are very brittle.

Gantnyu: Nagaland, Tribe Chang
A bamboo 100 to 125 mm in diameter, used as posts for houses.

Jatti: Assam

Kam/Kum: Nagaland, Tribe Chang

A bamboo with *leptomorph* rhizomes.

Khora: Assam

A bamboo with short internodes.

Kotta: Assam

A thorny bamboo.

La: Nagaland, Tribe Chang

A bamboo about 60 to 65 mm in diameter.

Moo: Nagaland, Tribe Chang

A bamboo with thorns at the node.

Mooli: Assam, Tripura

A bamboo with *leptomorph* rhizomes, used for the construction of houses and to make the mats used for the walls of the houses.

Pepu: Arunachal Pradesh, Tribe Apa Tani

A very thin-walled, small-diameter bamboo, which could be mistaken for a reed.

Phong: Nagaland, Tribe Chang

A bamboo 75 to 100 mm in diameter, used for the beams of houses.

Phulrua: Mizoram, Tribe Lushai

A large-diameter bamboo.

Puek: Nagaland, Tribe Chang

A large-diameter bamboo with fairly short internodes. This can be flattened by heating.

Rawnal: Mizoram, Tribe Lushai

Rawngal: Mizoram, Tribe Lushai

A bamboo with internodes almost 1,800 mm long.

Rawthing: Mizoram, Tribe Lushai

A very strong bamboo used to make winnowing trays and bows.

Rijang: Arunachal Pradesh, Tribe Apa Tani

A bamboo about 13 mm in diameter.

Sai/Say: Meghalaya, Tribe Khasi

Sairil: Mizoram, Tribe Lushai

A long creeper-like bamboo.

Seij: Meghalaya, Tribe Jaintia

Skhen: Meghalaya, Tribe Khasi

A small-diameter reed bamboo, used to make rain shields.

Tabiy: Arunachal Pradesh, Tribe Apa Tani

A bamboo 50 to 65 mm in diameter, with long internodes and a thorny node.

Tabow: Arunachal Pradesh, Tribe Adi Gallong

A bamboo about 25 mm in diameter, and internodes about 225 mm long. It has a very flexible culm and is used for fishing rods.

Tabum: Arunachal Pradesh, Tribe Adi Gallong

A bamboo with internodes between 600 to 1,500 mm long.

Taddor: Arunachal Pradesh, Tribe Adi Gallong

A bamboo 25 to 40 mm in diameter, with internodes 150 mm long. It is used to make ropes.

Tajer: Arunachal Pradesh, Tribe Apa Tani

A bamboo 13 to 20 mm in diameter, with internodes 760 mm long. It is used to make baskets.

Talon: Nagaland, Tribe Chang

A large-diameter bamboo used to make flattened bamboo containers.

Tare: Arunachal Pradesh, Tribe Apa Tani

A bamboo about 25 to 40 mm in diameter. The plant looks like cane, but is different from the one mentioned below. It is used to make smoking pipes.

Tarre: Arunachal Pradesh, Tribe Apa Tani

A bamboo about 150 mm in diameter. The plant has fruit and looks like cane. It is used to make smoking pipes.

Tashur: Arunachal Pradesh, Tribe Adi Gallong

A bamboo about 25 mm in diameter, with internodes 300 to 450 mm long. It is solid, with a very soft core.

Tursing: Mizoram, Tribe Lushai

A solid bamboo about 25 mm in diameter used to make smoking pipes.

Uthaim: Nagaland

Vah: Nagaland

Waiyung: North Cachar Hills, Assam, Tribe Dimasa Cachari

Watti: North Cachar Hills, Assam, Tribe Dimasa Cachari

Wow: Nagaland, Tribe Chang

A bamboo 50 to 65 mm in diameter, with internodes 300 to 450 mm long. It is used to make baskets, and for binding joints.

Yabin: Arunachal Pradesh, Tribe Apa Tani

A rought-textured bamboo 25 to 40 mm in diameter. The green culm is poisonous.

Yaii: Arunachal Pradesh, Tribe Apa Tani

Appendix IV

Bamboo: Species and Characteristics

Arundinaria

This is a genera of erect or climbing shrub with slender stems and generally prominent nodes. The internodes are short. There are 80 species in the world and 26 are found in India out of which 18 are found in and around the northeastern region.

A. aristatus (Thamnocalamus aristatus)

A gregarious shrubby bamboo, 2.5 to 3.5 metres high, with yellow internodes and reddish branches. It is closely related to *Arundinaria spathiflora*. It is used for hookah tubes. This bamboo is found in the Sikkim-Bhutan Himalayas at an altitude of 2,900 to 3,300 metres, and in Assam and Arunachal Pradesh at an altitude of 2,000 to 3,000 metres.

A. callosa (Chimonobambusa callosa)

A bamboo about 3.5 metres high and 13 to 25 mm in diameter, with smooth internodes 150 to 250 mm long. It has spinous nodes with a ring of fine hair. The walls just above the nodes are thin. It is found in the Eastern Himalayas in the Nishi Hills, at an altitude of 1,400 to 2,000 metres, and in the Khasi Hills at an altitude of 1,800 metres.

A. clarkei

Found in Manipur and adjoining areas.

A. elegans (Sinobambusa elegans)

A bamboo with slender stems and smooth internodes. It grows 3.5 to 6 metres high and 7.5 to 9 mm in diameter, with internodes 175 to 225 mm long. Found in Upper Assam and the Naga Hills at an altitude of 1,700 metres.

A. falconeri (Thamnocalamus falconeri)

A shrubby bamboo which grows upto 6 metres high, and 13 to 19 mm in diameter. The internodes are 200 to 375 mm long with a wall thickness of 3 mm. The young stems are often striped yellow and green, but older plants are scurfy white. The nodes are swollen. It is used for baskets, hookah tubes and fishing rods. Found in the Eastern Himalayas, Assam, Meghalaya and Arunachal Pradesh at an altitude of 1,800 to 2,700 metres.

A. gracilis

It is found in the Eastern Himalayas.

A. griffithiana (Chimonobambusa griffithiana)

A gregarious olive green bamboo, 3 to 9 metres high and 25 to 40 mm in diameter. The striated internodes are 175 to 225 mm long and the node has a ring of tawny hair. It is found in Arunachal Pradesh and the Naga, Khasi and Jaintia Hills at an altitude of 900 to 1,400 metres.

A. hirsuta

A bamboo with greyish-green stems, growing singly, 1 to 2.5 metres high and 5 to 8 mm in diameter, with internodes upto 330 mm long. The nodes are smooth and the walls of the internodes are thin. It is found in the Khasi and Naga Hills at an altitude of 1,500 to 4,600 metres.

A. hookeriana (Chimonobambusa hookeriana)

A bamboo with slender, glaucous stems which are often striped green and yellow. It grows 4.5 to 6 metres high, and 16 to 40 mm in diameter. The mature internodes are about 200 mm long, and the wall thickness is 2.5 mm. It grows in Sikkim, Arunachal Pradesh and the Khasi hills at an altitude of 1,200 to 2,100 metres.

A. intermedia (Chimonobambusa intermedia)

A bamboo with slender greyish-green stems. The nodes are swollen with a whitish ring below them. It grows 2.5 to 3.5 metres high, with internodes 125 to 250 mm long, and a wall thickness of 2.5 to 5 mm. It is used for hookah tubes and fishing rods. Found in the Sikkim Himalayas and Arunachal Pradesh at an altitude of 1,200 to 2,700 metres.

A. khasiana (Chimonobambusa khasiana)

A bamboo with dark green or blackish stems, with prominent nodes. It is stronger than *Arundinaria falcata*, but it is often difficult to differentiate between the two. Found in the Khasi hills at an altitude of 1,500 to 1,800 metres.

A. maling

It is found in North Bengal, Sikkim and Arunachal Pradesh at an altitude of 1,700 to 2,600 metres.

A. mannii

A wiry, climbing bamboo, with a smooth, slender, solid stem that grows upto 9 metres long. It has swollen nodes, many branches, and internodes about 900 mm long. Found in Assam and in the Jaintia Hills at an altitude of about 900 metres.

A. microphylla

A low, shrubby, gregarious bamboo, 0.6 to 1.2 metres high with internodes 50 to 75 mm long. It grows in damp places, and is found in Bhutan, Sikkim and the Khasi Hills at an altitude of 1,800 to 3,000 metres.

A. pantlingii (Semiarundinaria pantlingii)

This is found in Arunachal Pradesh upto an altitude of 3,000 metres.

A. polystachya

A small shrubby bamboo with soft stems. It is found in the Khasi Hills at an altitude of 900 to 1,500 metres.

A. prainii (Thamnocalamus prainii)

A semi-scandent bamboo with slender, wiry, yellowish stems upto 9 metres long, and 5 to 8 mm in diameter. The climbers are solid or with a very small lumen, and the nodes are swollen. It is used to make baskets, and for building huts. Found in

Assam and the Naga and Jaintia Hills at an altitude of 900 to 2,400 metres.

A. racemosa

A bamboo 1.5 to 4.5 metres high and 17 to 50 mm in diameter. It is blue-green when young, and has thin walls and nodes that are not prominent. It is used for baskets, mats, etc. The leaves are used as fodder for cattle and ponies. Found in Eastern Nepal, North Bengal, Sikkim and Arunachal Pradesh at an altitude of 1,800 to 3,600 metres.

A. rolloana

A bamboo about 2.5 metres high and 5 to 13 mm in diameter, with internodes 250 to 300 mm long. The rough stems, slightly flattened on one side, are green when young, and turn yellow as they grow older. The walls are thin, and the leaves are broad. It is found in Assam and the Naga hills at an altitude of 1,500 to 2,100 metres.

A. spathiflora (Thamnocalamus spathiflorus)

A gregarious, shruby bamboo, 3.5 to 6 metres high and 13 to 19 mm in diameter. The internodes, 150 to 370 mm long, are a smooth, glaucous green when young, becoming yellow or reddish-brown as they grow older. It is used for baskets, mats, pipe stems, peasticks, etc. It grows in the Western Himalayas upto Nepal at an altitude of 2,100 to 2,700 metres, and in Arunachal Pradesh and Assam at an altitude of 650 to 2,700 metres.

Local name: *ringal* (Hindi).

A. suberecta

A wiry, erect bamboo with smooth, olive-green stem, 3 to 4.5 metres high and about 8 mm in diameter. The internodes are 150 to 250 mm long. The walls are thick and the nodes are slightly swollen. It is found in the Sikkim Himalayas, and the Khasi and Jaintia Hills at an altitude of 1,200 to 1,500 metres.

Bambusa

This is a genera of large, usually erect shrubs or trees. The bamboos are generally arborescent, not climbers, and are found at an altitude of 900 to 2,100 metres. Out of 70 world species, 26 are found in India, and at least half of these are found in the northeastern region.

B. affinis

A bamboo with pale green striped culms cultivated in Tripura in dense groves. Culms are almost solid and grow from 3 to 6 metres high and 12 to 40 mm in diameter. It has a very high bending strength and does not split easily under load conditions. It is a highly favoured species for sports goods such as fishing rods, javelin poles and polevault poles. It is a potential material for furniture construction analogous to colonial cane furniture and could be a substitute for cane. Its natural habitat is in the Khasi, Jaintia and Manipur hills upto an altitude of 1200 metres.

Local name: *kanak kais* (Tripura).

B. arundinacea

A bamboo with bright green, shiny culms, 24.5 to 30.5 metres high and 150 to 175 mm in diametrs. The nodes are prominent, the internodes are upto 460 mm long and the walls may be 25 to 50 mm thick. It is a thorny bamboo with knotty or straight culms, and thick intertwining branches which makes it difficult to extract individual culms. Used for floating heavy timber, construction work, house posts, ladders, tent poles, tonga shafts, mat-making and basketry. Also for paper pulp. The leaves are used as fodder. It grows wild almost throughout India upto an altitude of 650 metres and is cultivated in the lower Himalayas and the Indus and Ganges valleys.

Local names: *ketua bans* (Bengali); *kotoha* (Assamese); *kata borak* (Tripura); *sameibi* (Manipuri).

B. auriculata

An evergreen bamboo, 12 to 15 metres high and 50 to 60 mm in diameter with internodes 460 to 765 mm long. The basal internodes are shorter. The young plants are scurfy white, while the older plants are a glaucous yellow. The walls are thick. It is found in Assam, Silhet and Burma.

B. balcooa (Dendrocalamus balcooa)

A bamboo with tall greyish green stems 15 to 21 metres high, and 75 to 175 mm in diameter. The internodes are 200 to 460 mm long and the nodes are swollen. This bamboo can easily be made durable and resistant to insects by immersion in water. It is used for building construction and for paper pulp. Found from Bengal to Assam and Arunachal Pradesh upto an altitude of 550 metres.

Local names: *bhaluka* (Assamese); *barak* (Tripura); *unal* (Manipuri).

B. glaucescens

This is frequently cultivated as a hedge in Assam.

B. khasiana

A bamboo with dull, olive-green stem, growing singly 9 to 12 metres high and 25 to 40 mm in diameter. The internodes are 125 to 375 mm long and the walls are 2.5 to 7.5 mm thick. The nodes are not prominent, but have a whitish ring below and a bluish ring above them. The young plants are golden-yellow in colour. It is found in the Khasi, Jaintia and Naga Hills and in Manipur at an altitude of 300 to 1,200 metres.

B. longispiculata

This is found in Meghalaya and cultivated in Calcutta and Dehra Dun.

B. mastersii

A bamboo with a reed-like stem. It is found in Assam, at Dibrugarh.

B. nutans (Bambusa falconeri)

A bamboo growing singly, 6 to 12 metres high and 35 to 75 mm in diameter, with internodes 375 to 460 mm long. It is difficult to distinguish this bamboo from *Bambusa tulda*, without seeing the flowers. It grows in the Lower Himalayas, Assam, Sikkim and Arunachal Pradesh at an altitude of 550 to 1,400 metres.

Local name: *kali* (Tripura).

B. pallida

A bamboo with tall, graceful, olive-green stems 12 to 18 metres high, and 50 to 75 mm diameter. The internodes are 460 to 765 mm long, and the nodes are not prominent. The walls are thin. It grows in the Sikkim Himalayas, North and East Bengal, Arunachal Pradesh, the Khasi Hills and Assam at an altitude of 1,500 to 1,800 metres. It can be cultivated in the plains.

Local name: *makhal* (Tripura).

B. polymorpha

A large evergreen bamboo with greyish-green culms 15 to 25 metres high and 75 to 150 mm in diameter. The internodes are 375 to 610 mm long. The culms curve outwards and have swollen nodes. The young culms are scurfy white. It is used in Burma for roofs, walls and floors. Found in Burma, Assam and East Bengal.

Local names: *jama betua* (Bengali); *betua* (Assamese); *betu* (Tripura).

B. teres

A bamboo about 18 metres high and 75 mm in diameter. The internodes are 500 mm long and the walls 7.5 to 10 mm thick. It grows in East Bengal, Assam and Tripura.

Local name: *parua* (Tripura).

B. tulda

An evergreen, greyish-green gregarious bamboo, 6 to 21 metres high and 50 to 150 mm in diameter. The internodes are 300 to 610 mm long and the walls are 8 to 13 mm thick. This is a very useful bamboo, and can easily and effectively be seasoned by immersing it in water for a few days, which makes it durable and resistant to insects. Used for building constructions, mats and basketry, it is also used to make good quality paper and rayon. The young shoots are pickled and eaten. Found in Bengal, Assam and Burma.

Local names: *tulda* (Bengali); *jatti* (Assamese); *mirtinga* (Tripura).

B. vulgaris

A yellowish-green, or yellow and green striped bamboo, 6 to 15 metres high and 50 to 100 mm in diameter. The internodes are 250 to 460 mm long. It is an ornamental bamboo with thin walls and the culms grow singly. It grows and can be cultivated throughout tropical India.

Local name: *basini bans* (Bengali).

Cephalostachyum

This is a genera of shrubby bamboos with slender, straight stems.

C. capitatum

A thin-walled semi-scandent bamboo with yellow stem, 3.5 to 9 metres high and 25 to 40 mm diameter. The internodes are about 910 mm long. It is used in construction work, and to make bows and arrows. The leaves are used as fodder and the seeds are edible. Found in the Sikkim and Bhutan Himalayas, Arunachal Pradesh, and in the Khasi, Jaintia and Naga Hills at an altitude of 600 to 2,400 metres.

Local name: *silli* (Assamese).

C. fuchsianum

An arborescent, semi-scandent bamboo, with pale, small, soft thin-walled stem. It is found in Bhutan, the Naga Hills and the Nishi Hills at an altitude of 1,700 to 2,300 metres.

C. latifolium

A shrubby, semi-scandent bamboo, with thin, rough, dark-green stem. The nodes are conspicuous because of a whitish ring below them. It is found in Bhutan, Sikkim, Arunachal Pradesh, Naga Hills and Manipur Hills at an altitude of upto 2,100 metres.

C. pallidum

A sub-arborescent or shrubby bamboo. It is found in the Khasi and Mishmi Hills and Manipur upto an altitude of 1,500 metres.

C. pergracile

An arborescent bamboo, 9 to 12 metres high and 50 to 75 mm in diameter. The internodes are 300 to 460 mm long, and have thin walls. It is used for building, mat-making and as fishing rods. Found in Bhutan, Assam and the Naga Hills.

Local name: *latang, madang* (Assamese).

Dendrocalamus

A genera of arborescent bamboos with densely-branching roots. There are nine species in India and all of them are useful for the paper and pulp industry.

D. giganteus

A greyish-green bamboo, 24.5 to 30.5 metres high and 200 to 250 mm in diameter. It has hairy nodes and shortish internodes, and is one of the biggest bamboos in India. It is used in whole-culm form, for water buckets and containers. Also used for building and as boat-masts. Found in Burma and Malaya, and is cultivated in West Bengal, Assam and Malabar.

D. hamiltonii

A bamboo with erect or curved culms upto 25 metres high and 100 to 175 mm in diameter. The internodes are 300 to 500 mm long and the wall thickness is about 13 mm. It has long branches and a large lumen, and young culms are a scurfy white. Used in tea gardens to provide natural protection, its long branches intertwine to form an impenetrable barrier to winds. Its large lumen and long internodes make it useful as natural water containers. It does not crack or collapse during seasoning. The young shoots are eaten, and the bamboo is used to make paper. In Burma, inner layers of the bamboo are used as a substitute for cigarette paper. It is found in Assam, the Khasi Hills and in the Sub-Himalayan Region upto an altitude of 900 metres.

Local names: *pecha* (Assamese, Bengali, Tripura); *kake, kokua* (Assamese); *unep* (Manipuri).

D. hookeri

A bamboo 15 to 18 metres high and 25 to 40 mm in diameter. The internodes are 460 to 500 mm long and the walls are about 25 mm thick. It has long curving branches and the basal internodes are rough. Found in Assam, the Khasi, Jaintia and Naga Hills and the Nishi Hills at altitudes of 600 to 1,500 metres.

Local names: *ussey, asseygenga* (Assamese).

D. longispathus

A bamboo with grey-green culms, 12 to 18 metres long and 75 to 100 mm in diameter. The internodes are 250 to 610 mm long and the walls are

13 mm thick. The nodes, covered with a papery culm sheath which has irritant black hairs, often have roots growing from them. Leaves grow only towards the top of the culm. It is used to make paper, particularly kraft paper. Found in West Bengal, Assam and Silhet, growing along streams upto an altitude of about 1,100 metres. It can be propagated by burying culms horizontally so that shoots grow up from the nodes.

Local names: *khang* (Bengali, Assamese); *rupai* (Tripura).

D. patellaris

A bamboo with dull green, striated culms, 6 to 9 metres high and 25 to 40 mm in diameter. The internodes are 300 to 460 mm long. The walls are thin and the nodes have hairy rings. Found in the Sikkim Himalayas, the Naga Hills and Arunachal Pradesh.

D. sikkimensis

This is found in Sikkim, Arunachal Pradesh and in the Garo and Naga Hills at altitudes of 1,100 to 1,700 metres.

Dinochloa

A genera of climbing bamboos with zig-zag stems.

D. compactiflora (Melocalamus compactiflorus)

A greenish-grey, tufted, evergreen bamboo, 4.5 to 30.5 metres high and 13 to 65 mm in diameter. The internodes are 350 to 610 mm long. It has rough stems and thick nodes, and the culms arch and spread over tall trees. Used for basketry work, it is found in Cachar District of Assam, East Bengal and Burma.

D. maclellandii

This is found in Bengal, Assam and Burma.

Gigantochloa

These are arborescent or scandent bamboos and only one species is found in India.

G. macrostachya

A dark, evergreen bamboo, 7 to 34 metres high and 60 to 100 mm in diameter. The internodes are 400 to 760 mm long, and the walls about 7.5 mm thick. The culms may have white longitudinal stripes and young culms are glaucous green. Used for matting and basket work, it is found in Assam, and the Garo and Lushai Hills.

Local name: *tekserah* (Garo).

Melocanna

A genera of arborescent bamboo whose culms grow singly from a rhizome.

M. baccifera (Melocanna bambusoides)

An evergreen bamboo with straight, green, solitary stems 15 to 21 metres high and 35 to 90 mm in diameter. The internodes are 300 to 500 mm long. The culm branches only on top, and the nodes are seen as a narrow ring, very slightly swollen. The culms are strong and durable and are used for building houses, boats and scaffolding. It is used to make pulp for paper, and can also be made into activated charcoal. A siliceous secretion from the culms, known as *tabasheer,* is used in medicines. The fruits germinate soon after they fall and sowing them is one of the methods to artificially propagate this bamboo. The fruit is edible. The bamboo can also easily be propagated by offsets and rhizome cuttings. The culms attain their maximum height in about five years. It is found in Assam, Tripura and the Garo, Khasi and Lushai Hills.

Local names: *muli, bish, metunga* (Bengali); *tari wati* (Assamese); *muli* (Tripura); *maubi* (Manipuri); *mantak* (Mizoram).

Oxytenanthera

Arborescent or scandent bamboos, generally with a stout, creeping root stock. Out of five species in India, one is found in the northeastern region.

O. nigrociliata

A densely-tufted bamboo 9 to 12 metres high and 13 to 100 mm in diameter. It has rough internodes which may have yellow stripes. Used for building huts, fishing stakes, baskets, mats and paper pulp, it is found in Assam and the Garo Hills.

Local names: *kalia* (Bengali, Tripura); *kaligoda* (Assamese); *washut* (Garo).

Phyllostachys

Bamboos with smooth stems which are generally flattened on one side. There are three species in India.

P. assamica

A bamboo 9 to 12 metres high and upto 150 mm in diameter. Used for walking sticks, it is found in Lakhimpur District in Assam and in Arunachal Pradesh upto an altitude of 2,300 metres.

P. bambusoides

A tall, smooth, graceful bamboo with straight yellow culms upto 18 metres high and upto 115 mm in diameter, with short internodes. It is known as the giant timber bamboo of China and Japan. Used to make paper, it is found in Assam and in the Mishmi Hills.

P. mannii

A bamboo closely related to *Phyllostachys assamica,* 4.5 to 6 metres high and 25 to 40 mm in diameter. The internodes are 200 mm long. Used for walking sticks, it is found in the Naga and Khasi Hills at an altitude of 150 metres and is cultivated in Shillong.

Pseudostachyum

Shrubby bamboos with a creeping root stock.

P. polymorphum

A shrubby, often sub-scandent bamboo, with solitary stem upto 15 metres high and 25 to 50 mm in diameter. The internodes are 175 to 300 mm long and the walls are thin. It is used for umbrella handles, walking sticks and rafters. The culms can be moulded by bending over hot iron rods. It is supposed to be one of the best bamboos for basket work because it is easy to split, and is flexible and durable. Found in the Sikkim Himalayas, Assam, the Naga and Garo Hills and Manipur upto an altitude of 1,700 metres.

Local names: *bajal, basal, bojal, tolli, nal* (Assamese).

Teinostachyum

Shrubby or arborescent bamboos with thin arching stems.

T. dullooa (Neohouzeaua dullooa)

A dark-green bamboo, 6 to 9 metres high and 25 to 75 mm in diameter. The internodes are 400 to 1,000 mm long. The nodes are not prominent, but the internodes are whitish below the nodes, and have a few whitish hairs. It is found in Bhutan, Assam and the Khasi and Jaintia hills.

Local names: *dolu* (Tripura); *dalu* (Assamese); *dollu* (Manipuri); *rawnal* (Mizoram).

T. griffithii

A bamboo with slender arching, straggling or sub-scandent, stems 7.5 to 15 metres high and 13 to 19 mm in diameter with internodes 460 to 660 mm long. The walls are thin. Used for smoking pipes, umbrella handles and basket work, it is found in Arunachal Pradesh, the Naga and Khasi Hills, and in the Sibsagar, Lakhimpur and Dibrugarh districts of Assam.

Local names: *behti, beti* (Assamese).

T. helferi (Bambusa helferi)

A bamboo with bushy or climbing stems 6 to 12 metres high and 25 to 40 mm in diameter. The internodes are 500 to 1,250 mm long. The culms often arch towards the ground and take root. Young culms are velvety white or are striated with white hairs. Older culms may have a white band. The nodes are swollen and the walls are thin. It is found in the Garo, Khasi and Jaintia Hills.

Thyrosostachyus

These are arborescent, erect bamboos, and there are two species in India.

T. oliveri

A bamboo with large, straight culms 15 to 24 metres high and 25 to 100 mm in diameter. The internodes are 400 to 610 mm long. It grows from a stout root stock, and the young culms are bright green, turning dull or yellowish when they are older. The nodes are swollen and the walls are thin. Used for building, it is found in Assam and Burma.

T. siamensis

A bamboo with graceful culms 7.5 to 9 metres high and 35 to 75 mm in diameter. The internodes are 200 to 275 mm long. The branches only grow towards the top of the culm and the nodes are not prominent. It is planted for ornamentation in monasteries and is sometimes known as Monastery Bamboo. It is used for umbrella handles and is sometimes known as Umbrella Handle Bamboo. It can be used for fishing rods and is used in Thailand to make paper. Found in Assam and Burma.

Appendix V

Cane: Local Names

The following information about the characteristics and uses of various species of cane locally available in the northeastern region has been collected from the local craftsmen.

Aadaa: Arunachal Pradesh, Tribe Adi Gallong
Diameter: about 100 mm. Splits from the outer and second layers are used to make baskets, while the inner core is discarded.

Gola: Assam
Diameter: 19 to 25 mm. It is used to make furniture, and is not very strong in split form.

Ham: Nagaland, Tribe Khiamngan
This cane is used in fine splits that are dyed red and used to make ceremonial products.

Hruipui: Mizoram, Tribe Lushai

Hruitung: Mizoram, Tribe Lushai
The splits of this cane are very supple and are used to make braided head-straps.

Jatti: Assam
Diameter: 19 to 22 mm. It is used to make whole-cane baskets and is not very strong as splits.

Jatti Lejai: Assam

Kawrtai: Mizoram, Tribe Lushai

Liphet: Manipur
Diameter: 12 to 19 mm. It is a poor-quality cane with coarse fibres. It cannot be used effectively for handicraft products, but is used in the round for furniture.

Liren: Manipur
Diameter: 12 to 40 mm. It is used for furniture.

Mawt: Mizoram, Tribe Lushai
A large cane, almost as thick as a man's wrist.

Mitperh: Mizoram, Tribe Lushai
Diameter: 12 to 19 mm. It is used to make the Mizo stool, and for reinforcing the rims and bodies of baskets.

Osso Romay: Arunachal Pradesh, Tribe Adi Gallong
A cane like *sundi.* Diameter: 6 to 9 mm. Splits are used to make the braided straps for baskets.

Raidang: Assam
A cane with prominent nodes. Diameter: 25 to 40 mm. It is used to make furniture, and the splits are used for binding.

Raiwai: N.C. Hills, Assam, Tribe Dimasa Cachari
The splits of this cane are used for binding joints.

Rupfu: Nagaland, Tribe Angami Naga
This seems to be the same as *jatti,* and is used to make the fine Angami carrying baskets.

Sundi: Assam
Diameter: 6 to 9 mm. It is very flexible and has a high tensile strength. Used for binding joints in furniture and baskets.

Taite/Tairua: Mizoram, Tribe Lushai
A thin, supple cane. Splits are used for binding joints.

Takek: Arunachal Pradesh, Tribe Adi Gallong
A cane similar to *tarre.* Diameter 25 to 40 mm. It grows very long, and the outer splits are used to make baskets.

Takhere: Arunachal Pradesh, Tribe Apa Tani
Diameter: 12 to 40 mm. It is hard, brittle, and difficult to use in split form. However, the Apa Tani ceremonial tails are made from red dyed splits of this cane.

Tarp: Arunachal Pradesh, Tribe Apa Tani
Diameter: about 25 mm. It is resistant to weathering and splits are used for binding.

Tarre/Tarrii: Arunachal Pradesh, Tribe Adi Gallong
Diameter: 25 to 40 mm. It grows between 50 to 60 metres long, and a 20-year-old cane is considered to be the best. It is used to make baskets and *dao* cases. Splits are used for binding.

Tassar: Arunachal Pradesh, Tribe Adi Gallong
A cane that is available in long lengths. Diameter: 16 to 19 mm. The splits are used to make braided straps.

Tasseen: Arunachal Pradesh, Tribe Adi Gallong
Diameter: about 6 mm. It is used to make tribal hats, formed by coiling.

Theru: Nagaland, Tribe Angami Naga
Diameter: 6 to 9 mm. Fine splits of this cane are dyed red and used to make ceremonial headgear and leggings.

Thilte: Mizoram, Tribe Lushai
Splits of this cane are used for binding.

Tussar: Arunachal Pradesh, Tribe Apa Tani
Diameter: 12 to 19 mm. It is very flexible and is used to strengthen baskets, etc. Splits can be bent sharply without cracking, and are therefore used for binding.

Yairi: Manipur
Diameter: 6 to 9 mm. This is similar to *sundi* and the splits are used for binding.

Yairi Manbi: Manipur
Diameter: 6 to 13 mm. This is a poor-quality of *yairi.*

Yali: Manipur
Diameter: about 19 mm. It is used for certain parts of furniture.

Yesso: Arunachal Pradesh, Tribe Apa Tani
Diameter: about 25 mm. Splits are used for braided straps.

Yoyi: Arunachal Pradesh, Tribe Adi Minyong
Diameter: about 6 mm. It is used to make braided straps for baskets, etc.

Appendix VI

Cane: Species and Characteristics

Calamus

Calamus, a sub-tribe of *palmae*, has about 390 species of palms that are found in tropical and sub-tropical regions. Most species are climbers that scramble and twine among the trees in the forest with the help of hooked spines on the leaves and leaf sheaths. Many of the climbers are the canes or rattans used for commercial purposes. They have long stems which are generally straw-yellow, solid, cylindrical and of a uniform thickness. They are strong, tough and elastic, with a shiny, hard, smooth outer layer that has a deposition of silica. The core is generally spongy. About 30 species of *calamus* are found in India.

C. acanthaspathus

A slender scandent cane, 19 to 25 mm in diameter with internodes 150 mm long. The leaves are 600 to 900 mm long, with leaflets 250 to 400 mm by 50 to 75 mm. The fruit is 16 mm in diameter and has chestnut-brown scales. It is a strong cane, used as cables for suspension bridges as a substitute for rope. It is also used for wicker work, baskets and containers. Thick canes are used for furniture frames, walking sticks, polo sticks and umbrella handles. Found in East Nepal, Sikkim, Bhutan, Assam and the Khasi Hills upto an altitude of 1,200 metres.

C. collina (Calamus collinus)

A cane smaller than *Calamus erectus*, with ellipsoid fruit. It is found in the Khasi Hills.

C. erectus

A cane with tall, stout, erect stems, 3.5 to 5.5 metres high, and 25 to 30 mm in diameter, with internodes 50 to 75 mm long. It is densely tufted, with leaves 3,600 to 5,500 mm long and leaflets 460 to 600 mm by 35 to 50 mm. The fruit is ovoid-oblong, about 25 mm long with dark brown scales. It is found in the Sikkim Himalayas, Assam, Manipur and the Khasi Hills upto an altitude of 1,200 metres.

C. flagellum

A cane with stout, robust stems, 25 to 40 mm in diameter. It is scandent in long lengths. The leaves are 1,800 to 2,100 mm long with leaflets 600 to 760 mm by 25 to 40 mm. The fruit is ovoid-oblong, about 19 to 25 mm long. It is pale, with dark bands on the scales. Found in the Sikkim Himalayas, Assam and the Khasi Hills upto an altitude of 1,200 metres.

Local name: *nagagola bet* (Assamese).

C. floribundus

A cane with slender stems, about 13 mm in diameter. The leaflets are bright green, 250 to

460 mm by 25 to 40 mm. The fruit is about 13 mm in diameter, with pale yellow scales. It is found in the Khasi and Mishimi Hills and in Assam.

Local name: *lejai* (Assamese).

C. gracilis

A cane with slender, scandent, naked stems, 6 to 9 mm in diameter. The leaves are 600 to 900 mm long with leaflets 125 to 175 mm long. The fruit is about 19 mm long, with straw-coloured scales. It is used for ballast baskets and for wicker work. Found in Cachar District of Assam and in the Khasi Hills upto an altitude of 1,200 metres.

C. guruba

A cane with tall, slender, scandent stems 6 to 9 mm in diameter. The leaves are 1,500 to 1,800 mm long with leaflets 300 to 375 mm by 12 to 16 mm. The fruit is about 6 mm in diameter, with pale scales and a brown margin. It is used for ballast baskets and many other purposes. Found in Assam and in the Khasi Hills.

Local names: *sundi* (Assamese); *yairi* (Manipuri); *kawrtai* (Mizoram).

C. latifolius

A cane with a stout stem, 12 to 25 mm in diameter with internodes 250 to 300 mm long. The leaves are 3,000 to 4,500 mm long with leaflets 300 to 610 mm by 25 to 65 mm. The fruit is narrow and almost 25 mm long. It is a pale dull yellow in colour. Used for walking sticks, umbrella handles and for wicker work. It is found from the Sikkim Himalayas to Assam.

Local name: *honka* (Assamese).

C. leptospadix

A cane with slender scandent stems. The leaves are 900 to 1,200 mm long with leaflets 200 to 250 mm by 8 to 13 mm. The fruits are about 13 mm in diameter, with broad yellow scales and a reddish-brown margin. It is found in the Naga and Khasi Hills and in Manipur.

C. tenuis

A cane with long scandent stems, 6 to 13 mm in diameter. The leaves are 460 to 610 mm long with leaflets 200 to 300 mm by 8 to 13 mm. The fruit is about 13 mm in diameter with pale yellow scales that have pointed tips. It is known as Assam cane and has a wide variety of uses—baskets, mats, screens, furniture and wicker work. Found in the Sub-Himalayan tract from Dehra Dun to Assam.

Local names: *jati bet* (Assamese); *mitperh* (Mizoram).

Daemonorps

A genus of perennial spinous climbing palms, many of which yield canes. There are four species found in India of which one is found in the northeastern region.

D. jenkinsianus

A stout cane with the stems about 19 to 25 mm in diameter. It has large leaves with leaflets 610 mm by 16 to 19 mm. The fruits are about 16 mm in diameter and pale yellow brown in colour. The stems are rather soft and are used for baskets and the crooks of umbrella handles. Found in the Sikkim Himalayas, Assam and the Khasi Hills.

Local names: *gola bet* (Assamese); *raichhauk* (Mizoram).

Plectocomia

A group of scandent spinous palms, of which four species are found in India. Two of these are found in the northeastern region.

P. assamica

A cane with large leaves with leaflets 460 to 610 mm by 50 to 65 mm. The fruits are about 25 mm in diameter and a bright rusty red in colour. It is used as other canes and is found in Upper Assam.

P. khasyana

A cane with stout stems about as thick as a man's arm, 18 to 25 metres high. The leaves are 9 metres long with leaflets 200 to 400 mm by 50 to 75 mm. The fruit is 25 to 40 mm in diameter. Used in split form, as other canes, it is found in the Khasi Hills.

Appendix VII

Use of Natural Dyes

The tribes of the northeastern region use a wide variety of natural dyes to enhance the appearance of their cane and bamboo products. The process of dyeing differs slightly from tribe to tribe. Some of these processes are described below:

Dyeing Red Cane in Khonoma

The Angami Nagas use deep red coloured splits of cane to make their ceremonial headgear and leggings. The cane is dyed in two stages, using three plants locally known as *meghu, tsenyu* and *nkhi.*

The cane, locally called *theru* (seems to be *sundi*), is cut from the forest in standard lengths. The measure is *thukenie* (*thu* means hand, and *kenie* means two; *do hath* in Hindi) and is determined by holding the cane below the foot and pulling the two ends upto the knee.

The cane is dried and normally thus seasoned for about a year. It is split in half along the length, and the outer surface cleaned by pulling the cane through a handful of bamboo or cane shavings mixed with wood ash. Bundles of 10 half-splits are made and tied at one end so that they can be easily hung up to dry.

Stage I—Yellow

The matured leaves of the *meghu* tree are collected in basket measures. They are pounded and soaked in water for a month with the dry cane splits. The water just covers the pounded leaves and the cane stays submerged at the bottom of the mixture. After about a month, the liquid is syphoned out leaving the pulp behind. The cane is now a pale yelow colour. Fresh water is added as required to maintain the consistency of the solution. The mixture is boiled for two to six hours to intensify the yellow colour, after which the cane is dried in the sun and stored. It can now be used as it is, or undergo a further process to convert it to a deep red colour.

Stage II—Red

The bark of the *nkhi*, a large tree, is pounded, mixed with water and boiled. The root of the *tsenyu*, a creeper that grows in rocky places, is pulverised and added to the *nkhi* bark, and the mixture is boiled again with the yellow cane. Boiling continues for a few hours till the desired shade of red is obtained. The quantity of the *tsenyu* root and *nkhi* bark are instinctively proportioned, but generally more *nkhi* than *tsenyu* is used. The depth of the red colour obtained depends on the proportions of these two elements and more of either may be added as and when required. A piece of the cane is removed from the mixture and dried in the fire periodically to check the colour. When the desired colour is obtained the cane is removed from the mixture, washed and dried in the sun. It is now ready for use, and may be split finer when the products are made.

Taboos

The craftsmen believe that certain strict social norms have to be followed in order to achieve successful results from the dyeing process.
They are:

1. No eggs should be hatched in the craftsmen's home during the dyeing of the yellow cane to red.
2. No members of the household or even domestic animals should give birth during this period.
3. As the cane begins to redden, the craftsman must not receive any guests—in fact he can only speak to members of his own household. (This is believed to be so to help concentration.)
4. The craftsman may not sleep with his wife during this period. (The reason appears to be the same as above.)

It is believed that if these norms are not followed carefully, the cane will not become the desired red colour.

The colour obtained is a deep rich red, but it does not penetrate below the top surface of the cane. However, it has light fastness as well as water fastness. The sample seen was reported to be about 30 years old.

Dyeing Goat's Hair in Khonoma

The Angami Nagas dye white goat's hair red and use it to decorate their ceremonial objects. The process is similar to the dyeing of red cane, but the plants used are different. The matured leaves of the *meghu-temu* tree (this is not the same *meghu* as is used in the dyeing of cane) are pounded and soaked in water with white goat's hair for four to five days. The yellow colour obtained is intensified by boiling the mixture for four to five hours. The yellow goat's hair is then dried in the sun. It may be used as it is or re-dyed to obtain a red colour.

Tsenyu is a creeper whose root is used. (This is again different from the one used for cane.) The root is cleaned and pounded to pulp which is mixed with the yellow goat's hair and allowed to stand for a while. Later water is added and the mixture is boiled.

Tisu is a plant whose rhizome is pounded and added to the boiling mixture. The proportions are adjusted as required and the boiling continues until the desired shade of red is obtained. The goat's hair is then removed and dried in the sun. The dyed goat's hair is used to decorate the handles of the ceremonial *dao* and spear.

Dyeing Reed Bamboo in Noklak

Chyu is a species of reed bamboo used by the Khiamngan Nagas in their ceremonial headgear. It grows tall and thin and generally needs a tree for support. It is 6 to 12 mm in diameter and has 25 to 40 mm long internodes. The leaves are long like those of other bamboos, and it grows in hilly forests in a cold climate.

The bamboo is harvested from the forest. Newly-matured plants are preferred to older ones. The bamboo is cut just below a node, so that the node can be used as a hook when splits are tied together for dyeing.

After being dried in the sun, the bamboo is cut into very fine splits about 1.5 to 2 mm wide. The outer layers of the splits are peeled off and tied together at the node in bundles about as thick as a finger.

The leaves of the *ham*, a medium-sized tree, are used for dyeing. Fresh leaves are pounded and mixed with water. The bamboo strips are put into this and the whole mixture is boiled for two to four days continuously, till both the leaves and the bamboo turn a deep yellow. More leaves are added if and when necessary. When the required colour has been obtained, the strips are removed from the mixture and the bundles are dried in a cool shady place. These can be used as they are, or further dyed to obtain a red colour.

The mature bark of *lungpai*, a big tree, is used to dye the yellow bamboo red. The outer layer of the bark is scraped off with the blunt edge of a *dao*, and pounded very fine. Just enough water to cover the pulp is added and allowed to stand for two to four days. When effervescence starts, the mixture is strained through a fine cloth. The pulp is thrown away and the liquor is retained.

The matured parts of the fibrous root of the *wye* creeper are collected. The root is washed, and the outer skin is mixed with the liquor. The yellow strips of bamboo are added to the mixture and boiled till the strips become the desired red colour.

The red strips are used in the headgear and leggings (*hokhu*). The strips may be used at the yellow stage when the orchid bark is not available.

Dyeing Black Cane in Longsom

The Wancho men near Longsom in Tirap District of Arunachal Pradesh wear loosely-coiled black cane belts around their waists. The cane is a rich ebony black which is obtained through a very simple process.

Cane is harvested from the forest, and outer splits about 6 mm wide and very long are cut. These splits are tied in a spiralling ring of the required diameter and stored over the fireplace till completely dry.

The rings are then dumped into a gutter or drain, and kept completely covered by wet marshy soil for 20 to 30 days. After this period the cane is removed from the mud and dried. It is thoroughly wiped with a cloth, during which process it acquires a lustre due to the abrasive action of the fine particles of mud that adhere to it. It is placed over the fire again, where it is smoked for 10 to 15 days till it becomes a rich black colour.

The Wanchos and the Noctes also use cane dyed in this manner for ceremonial hats and sometimes as decoration on baskets.

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